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**Matsumura et al.**

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(54) **WIRING MODULE**

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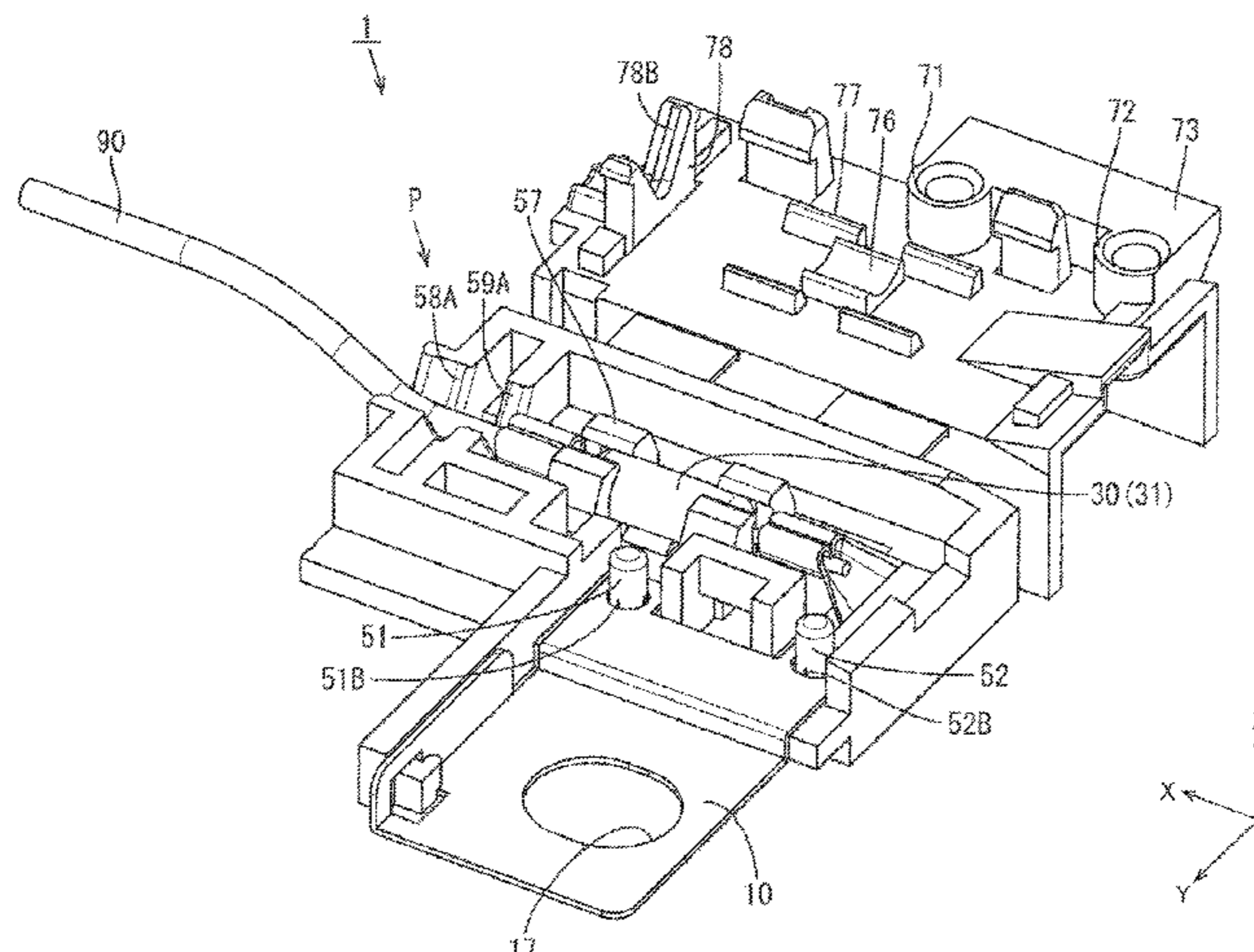
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(57) **ABSTRACT**

A wiring module to be attached to a plurality of power elements which store or generate power includes a bus bar connecting the power elements to each other or connecting the power element and a load to each other, an abnormality

(Continued)



detection element detecting an abnormality of the power element, and an insulating protector holding the bus bar and the abnormality detection element. The insulating protector is integrally provided with a first holding shaft portion and a second holding shaft portion which position and hold the bus bar by fitting the bus bar there onto, and an element holding portion which position and hold the abnormality detection element by fitting the abnormality detection element there into.

**7 Claims, 24 Drawing Sheets**

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*H01M 10/48* (2006.01)  
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*H01M 50/543* (2021.01)
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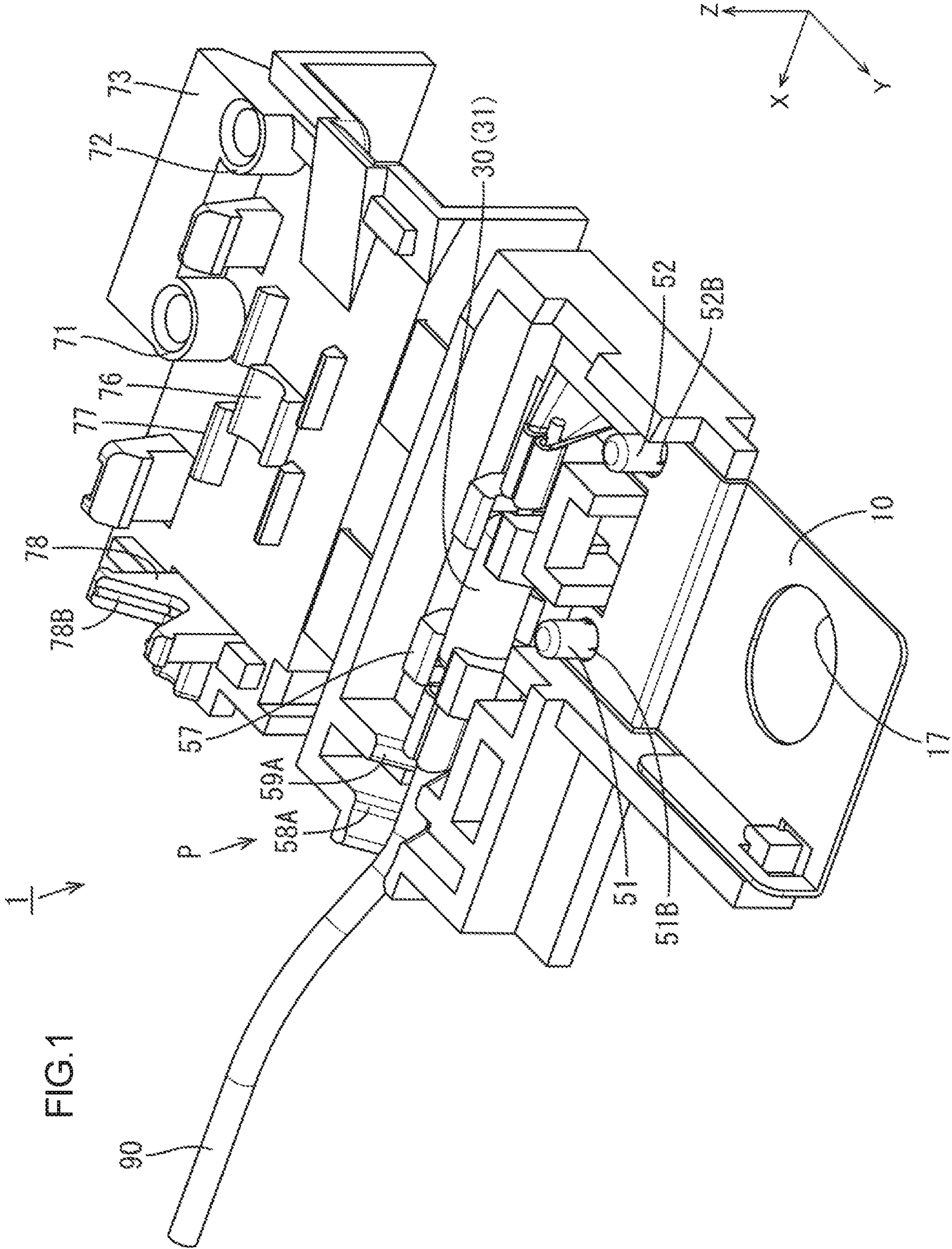
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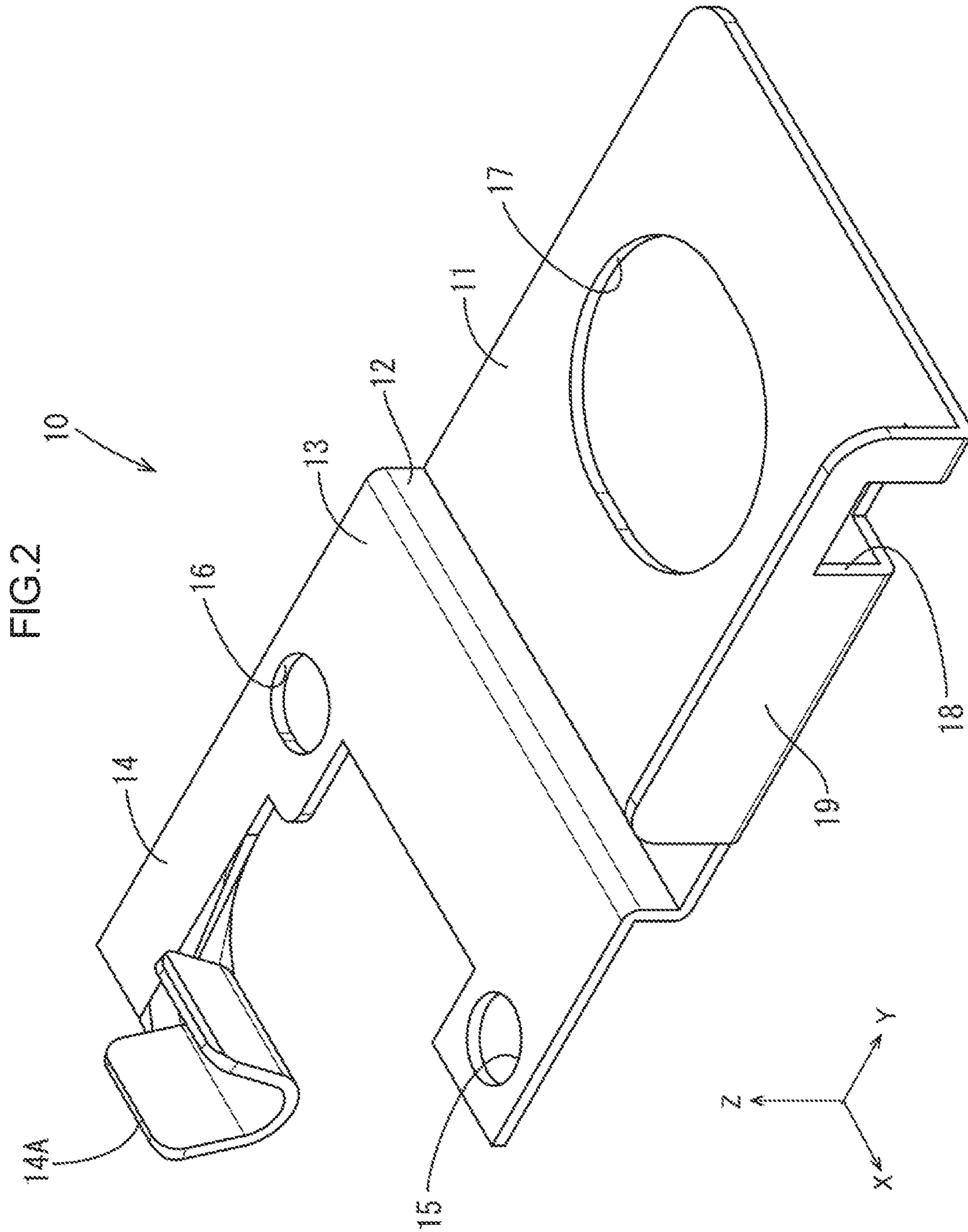


FIG.3

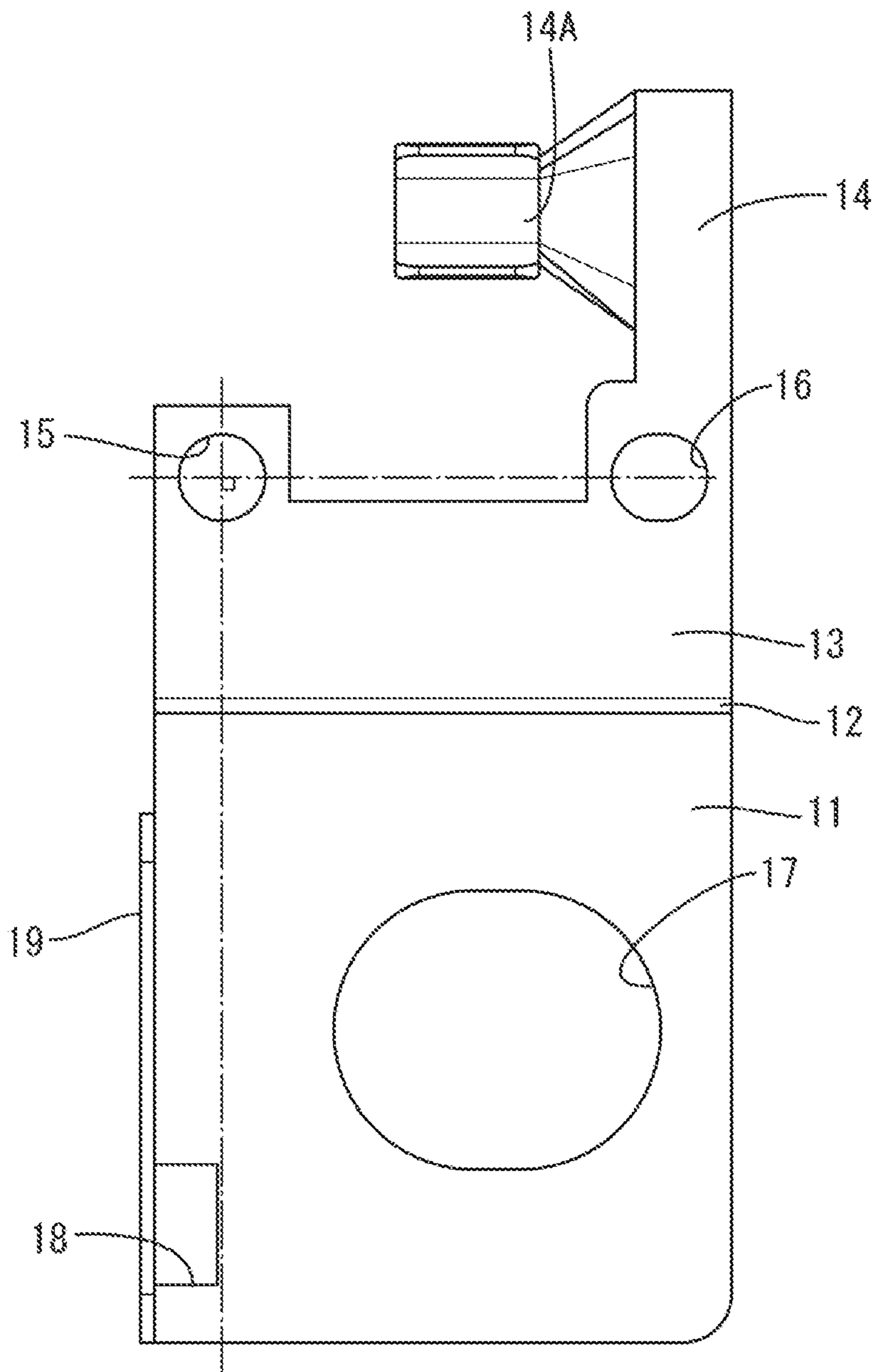
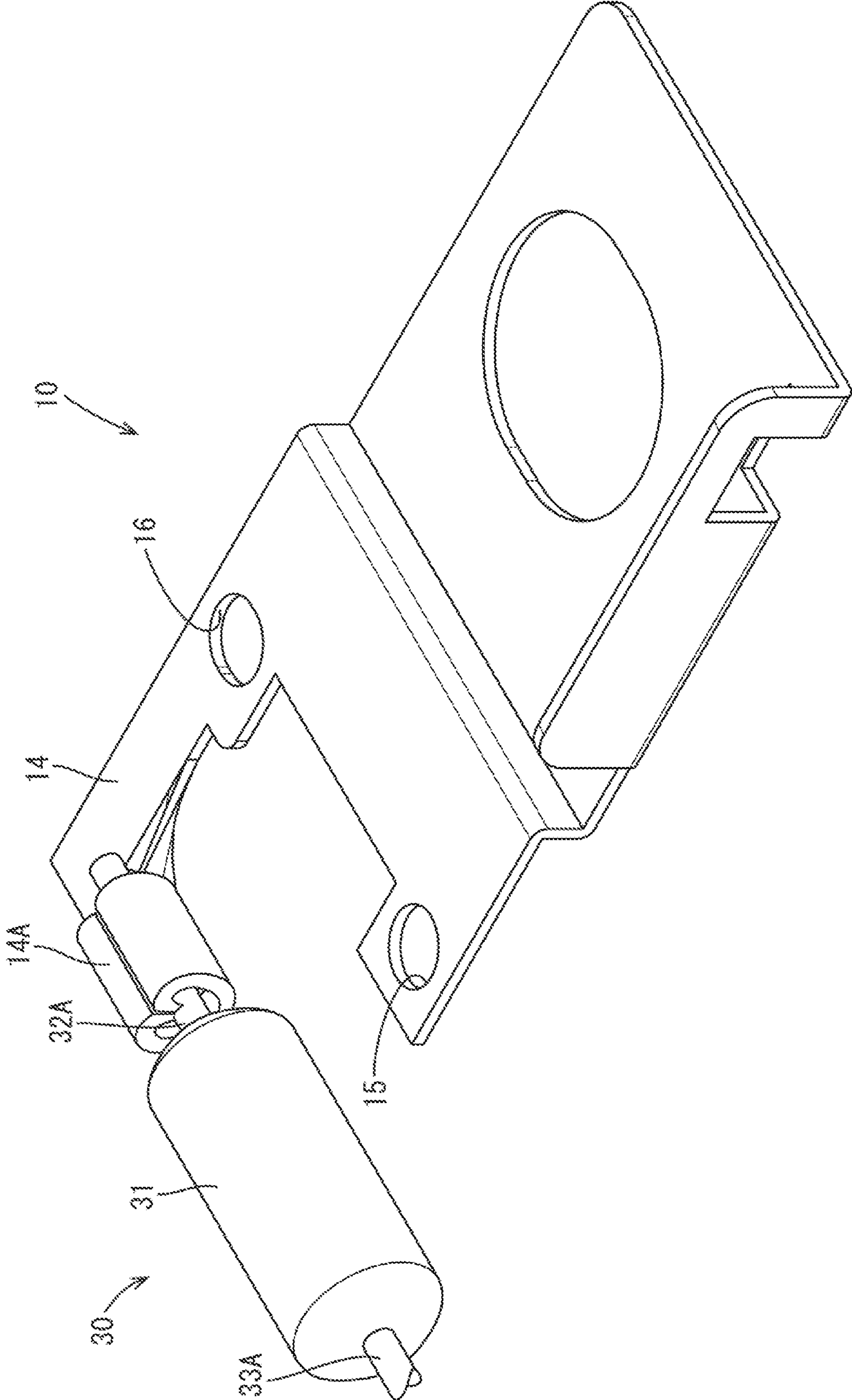


FIG.4



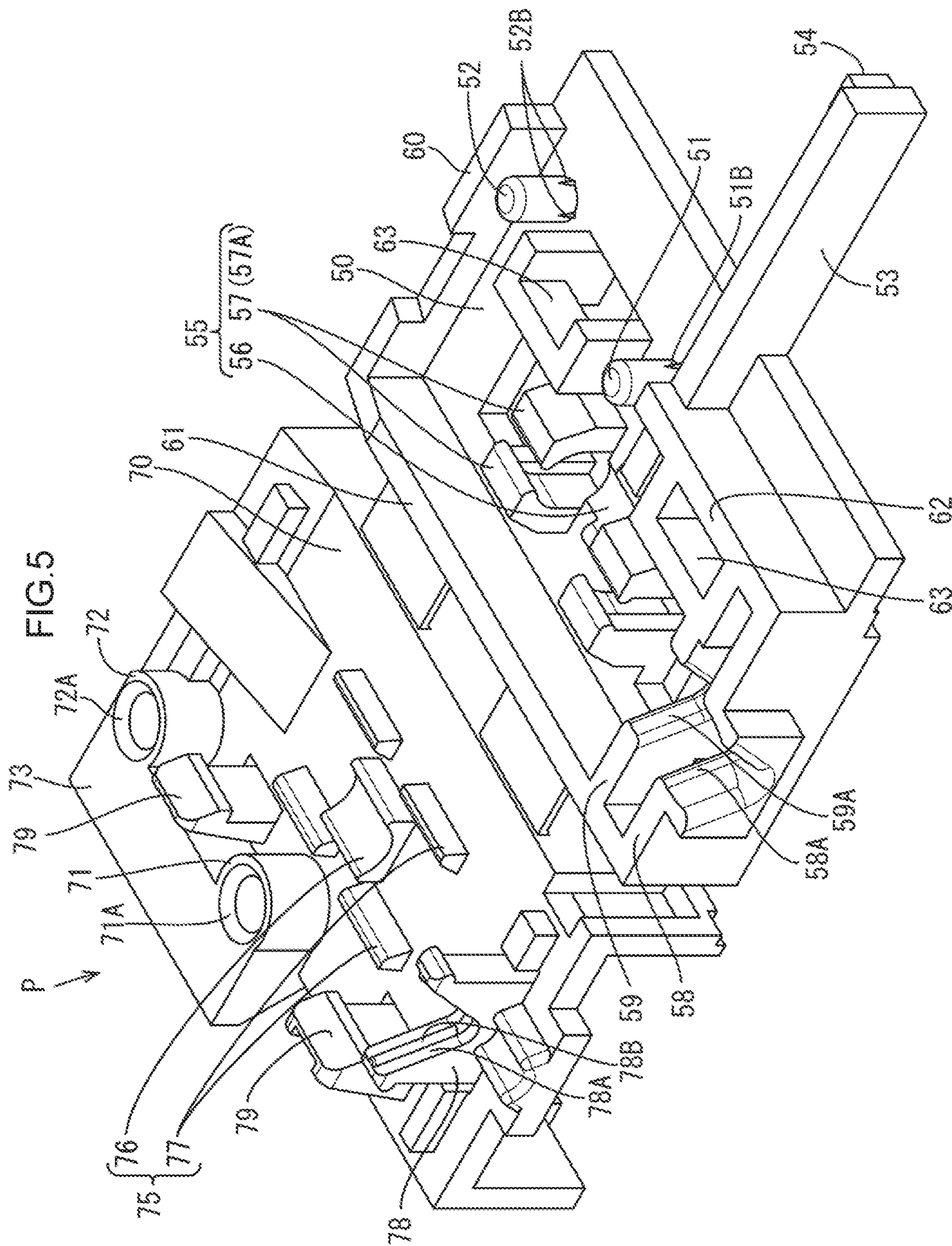


FIG.6

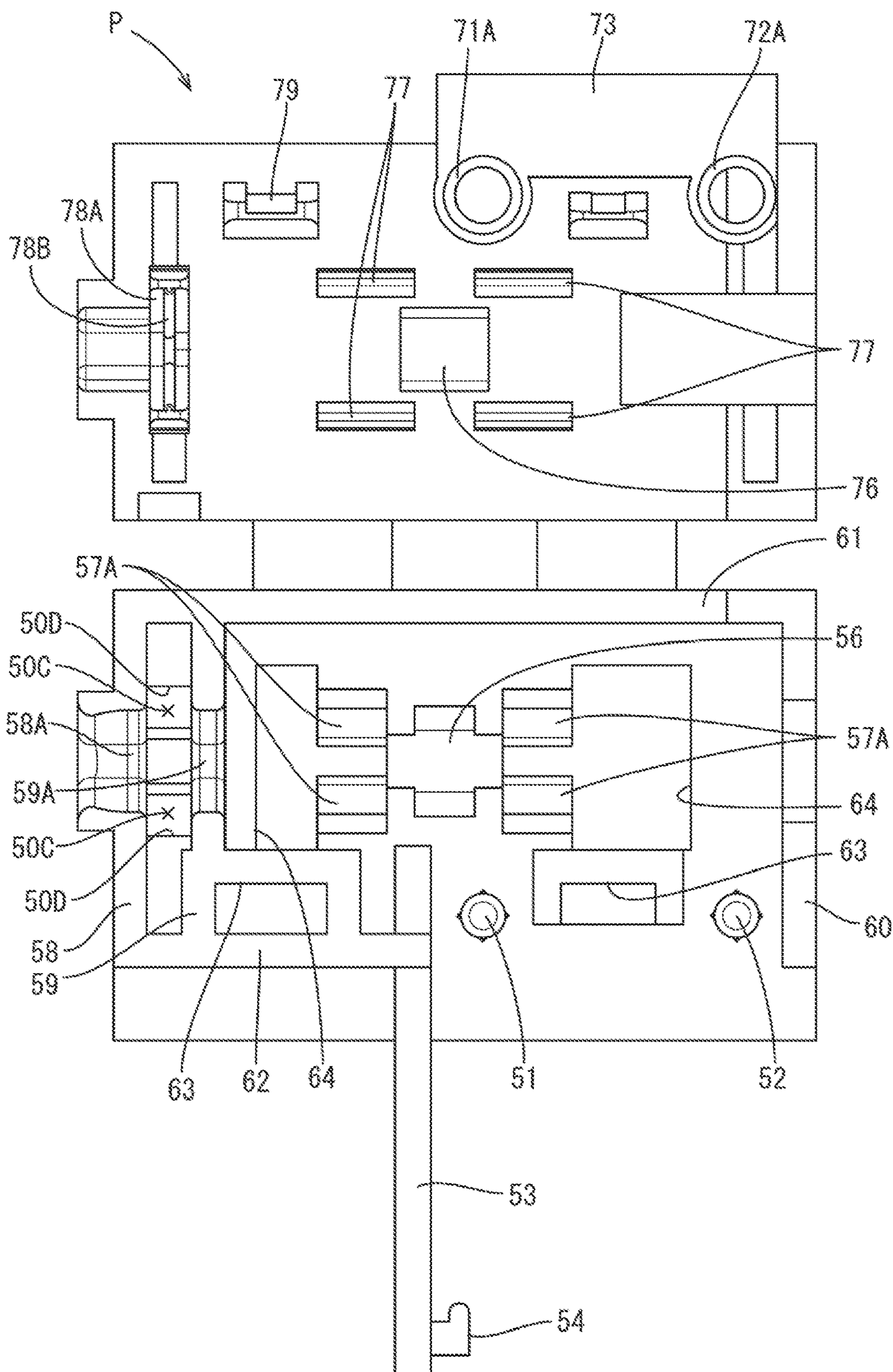




FIG. 7

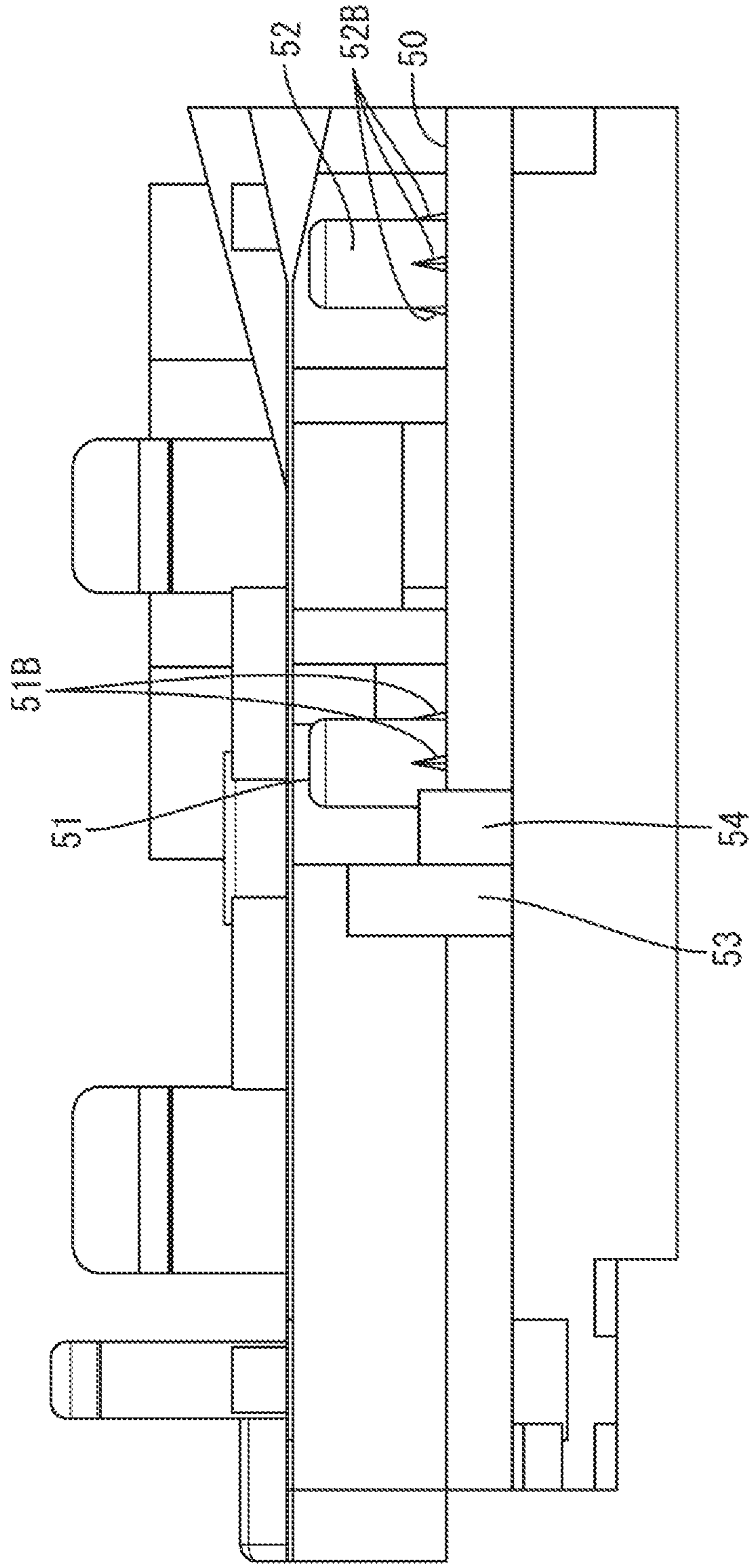
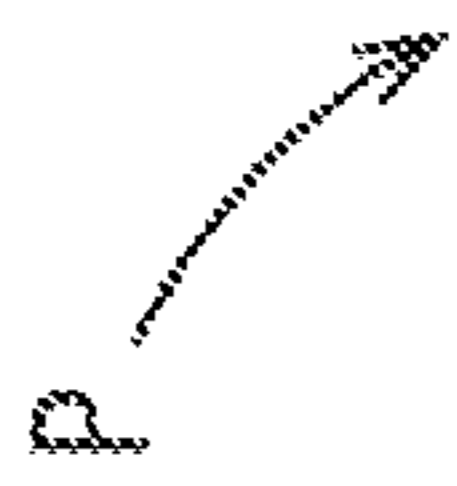


FIG. 8

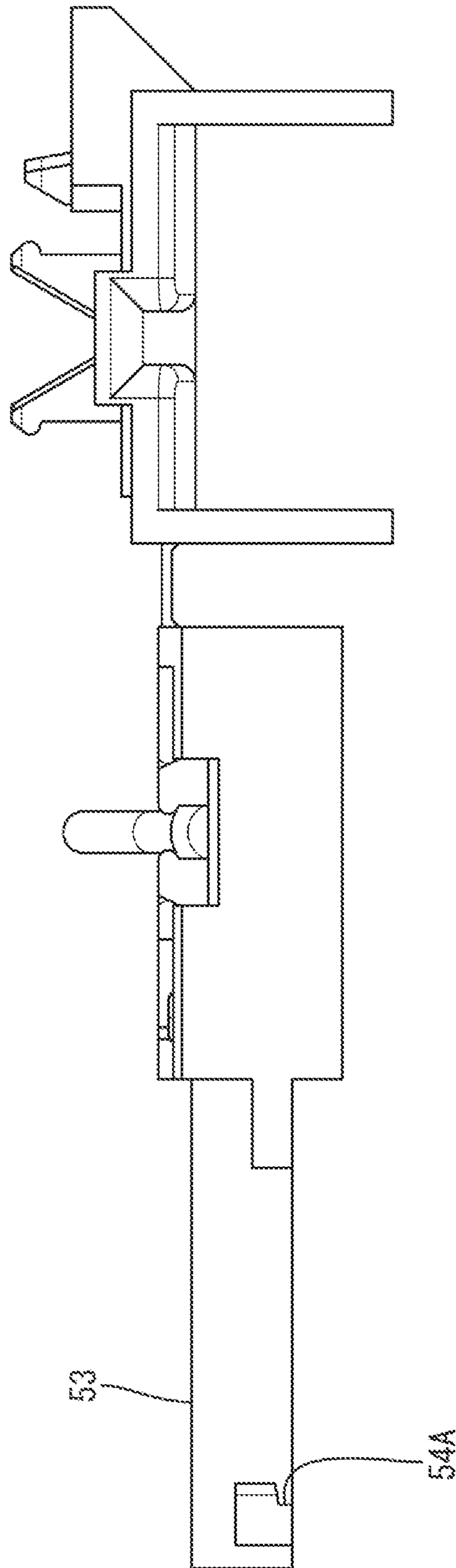
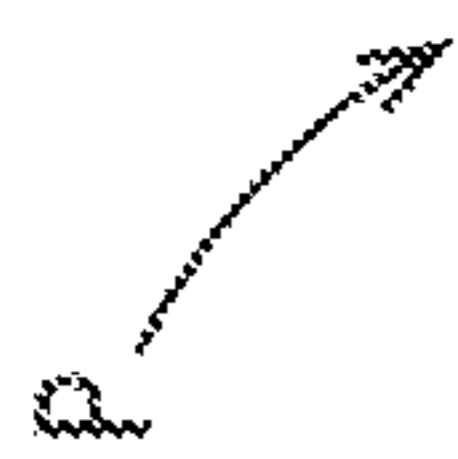


FIG. 9

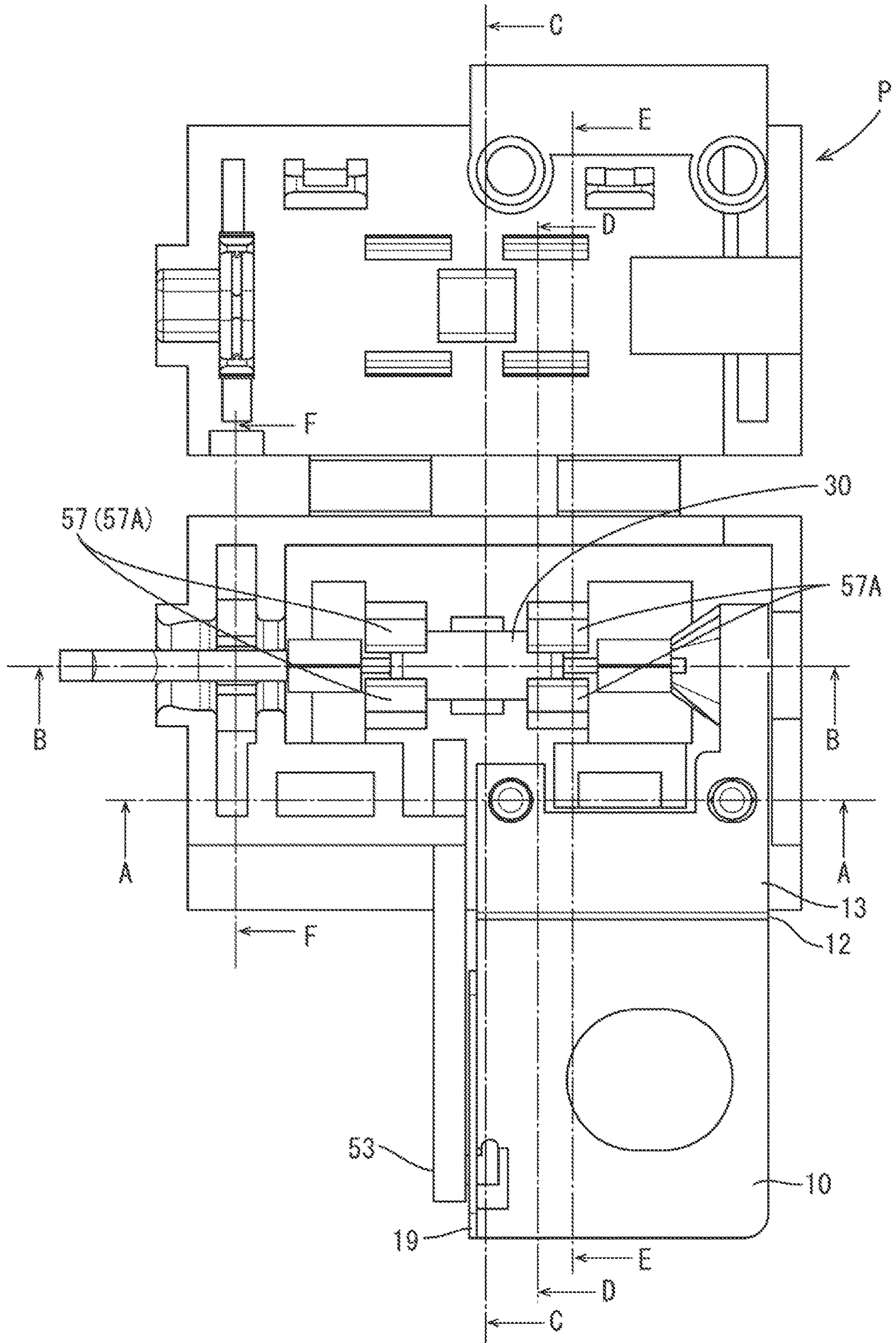


FIG.10

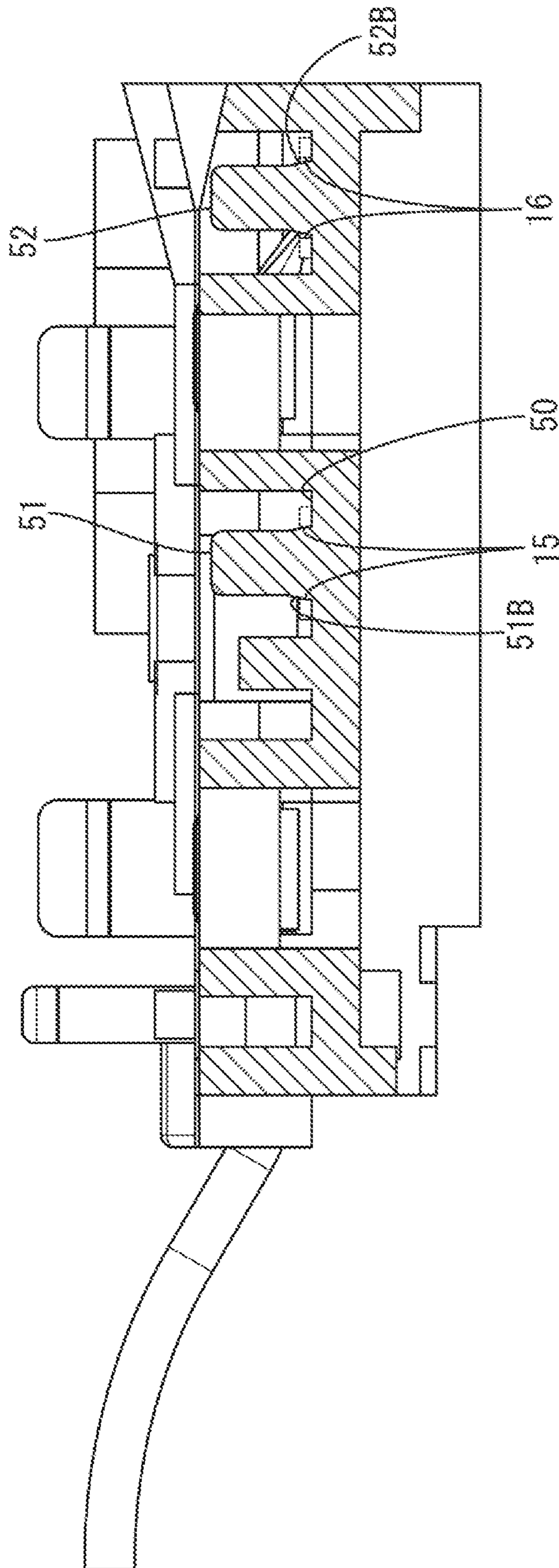


FIG.11

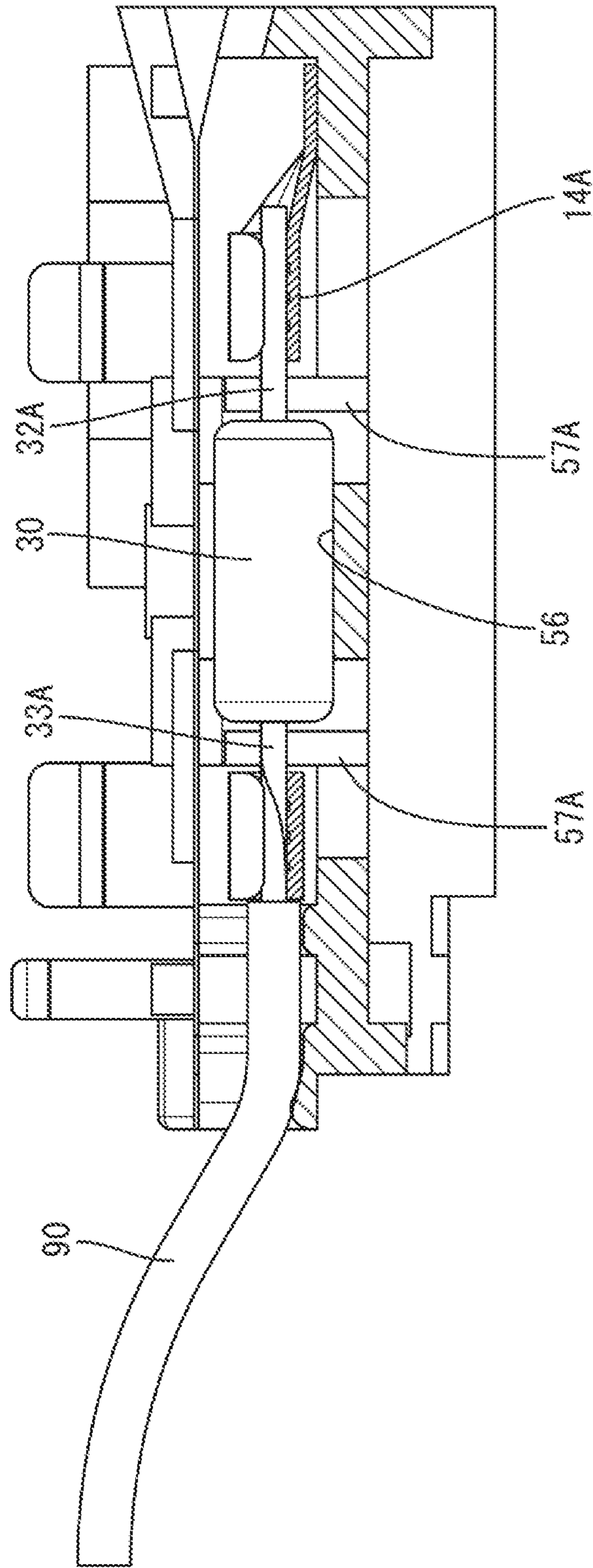


FIG.12

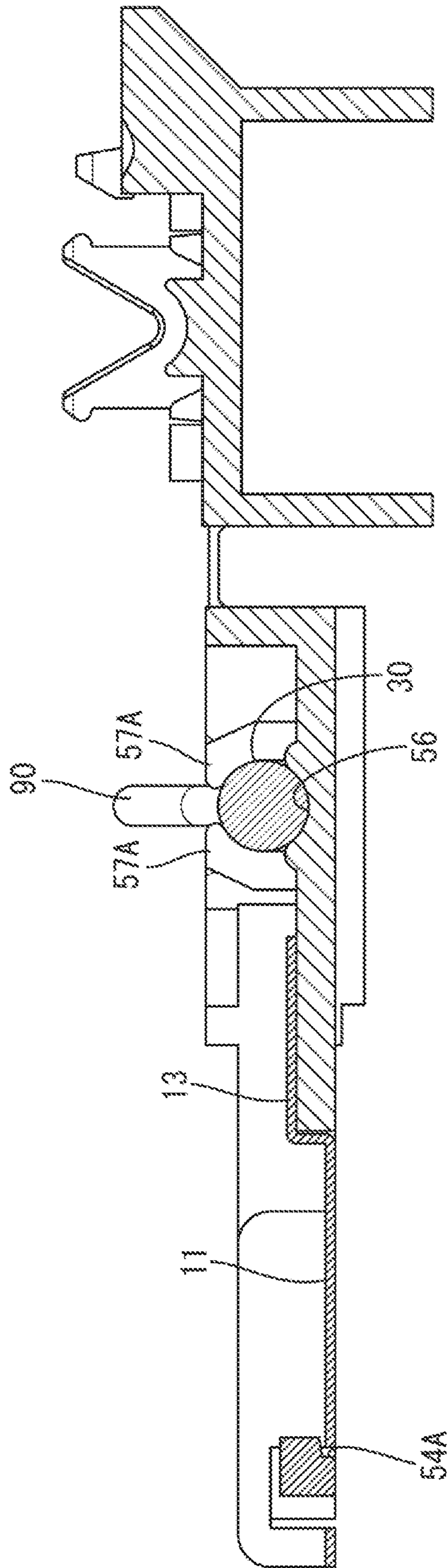


FIG.13

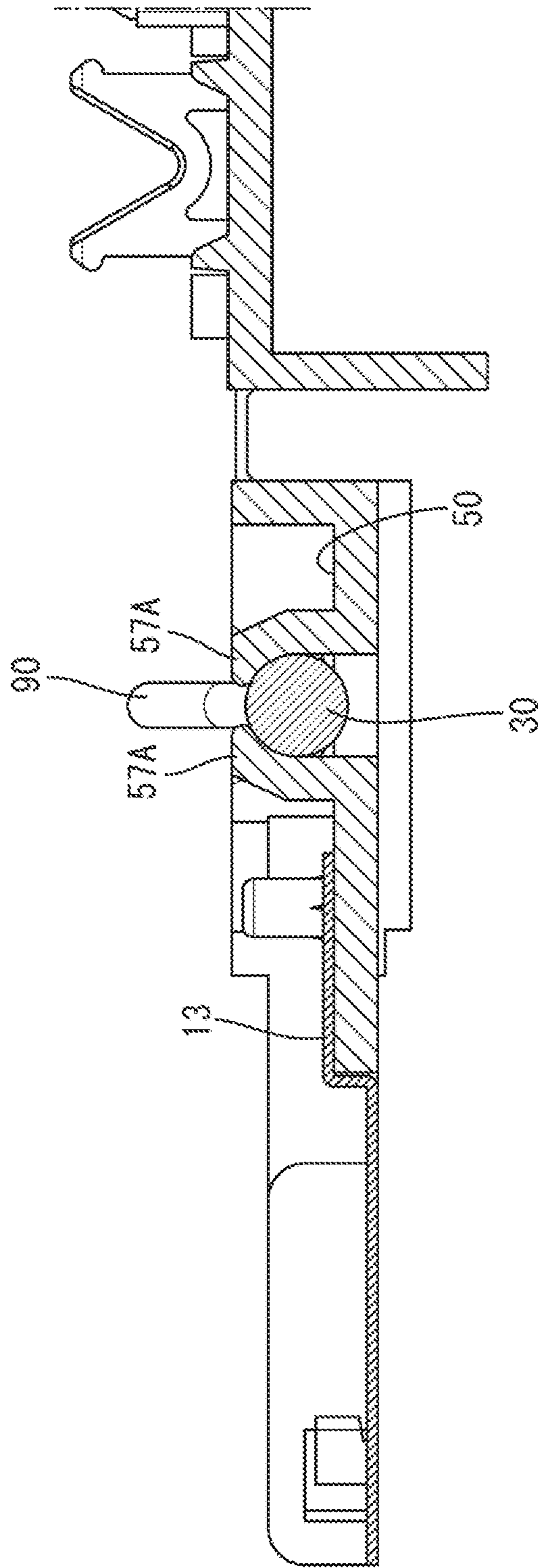


FIG.14

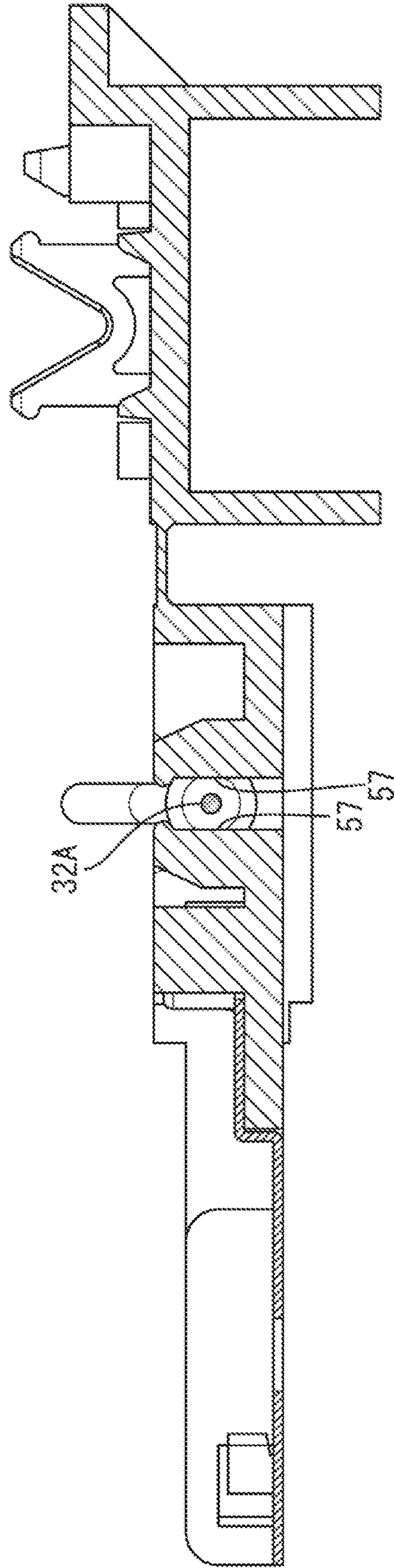
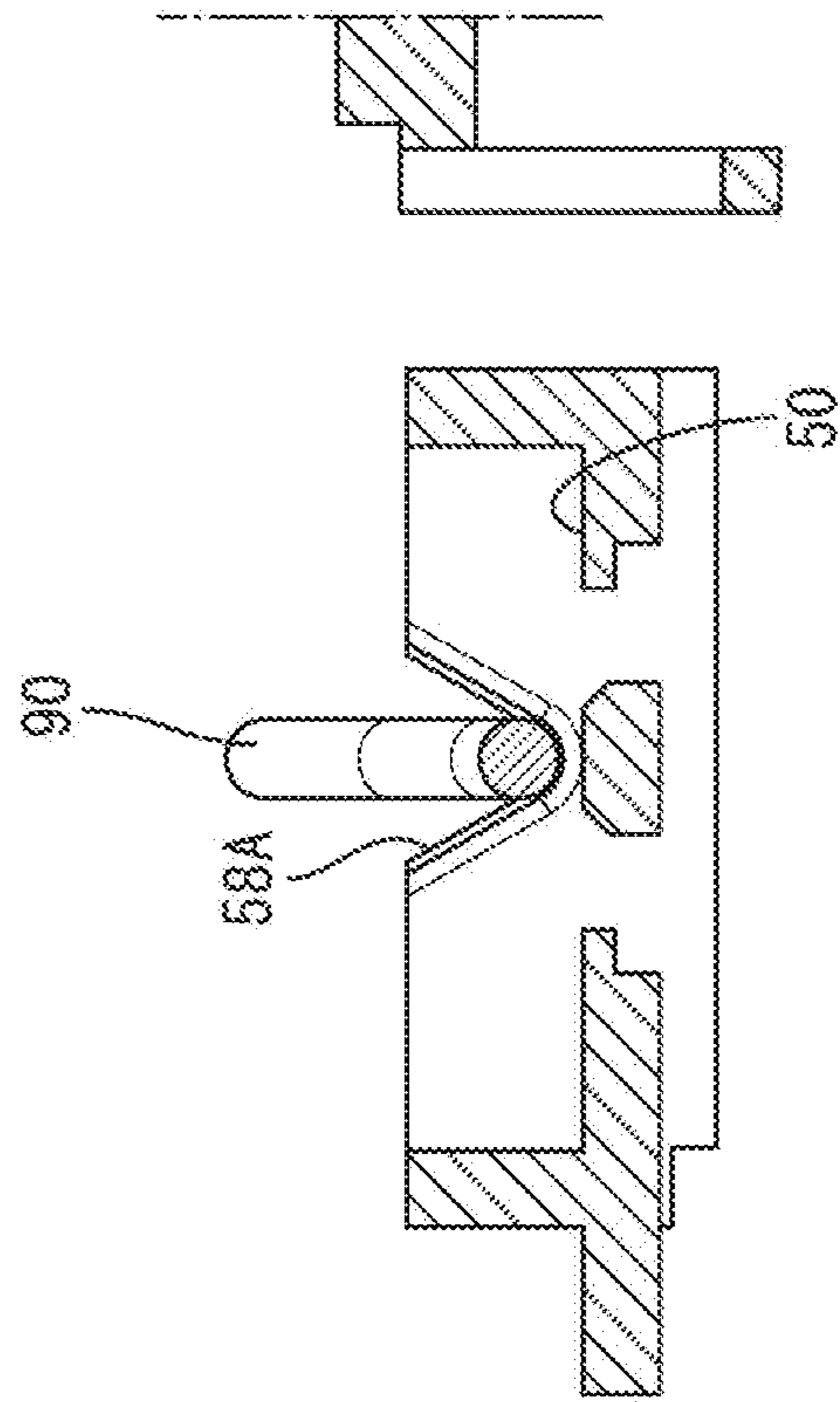




FIG. 15



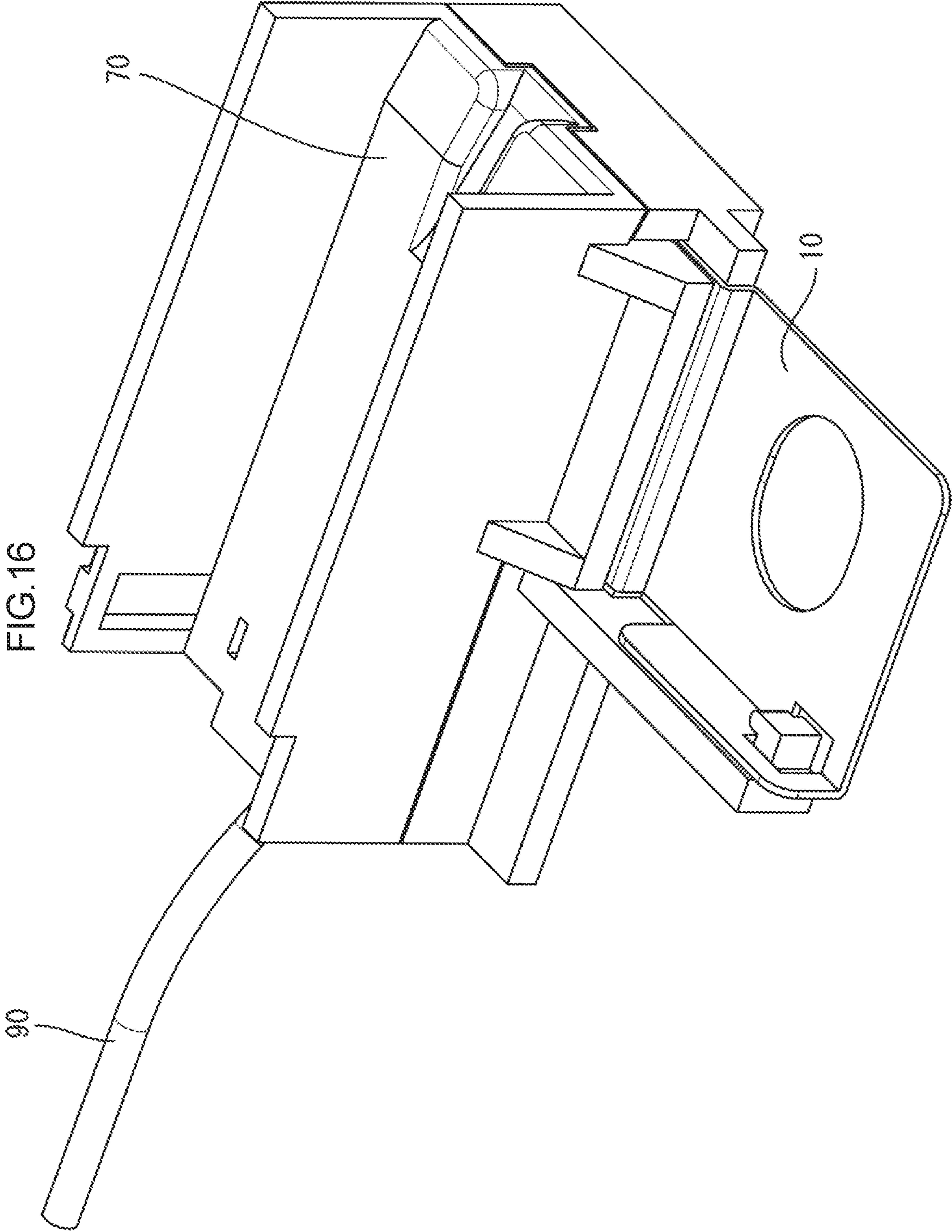


FIG. 17

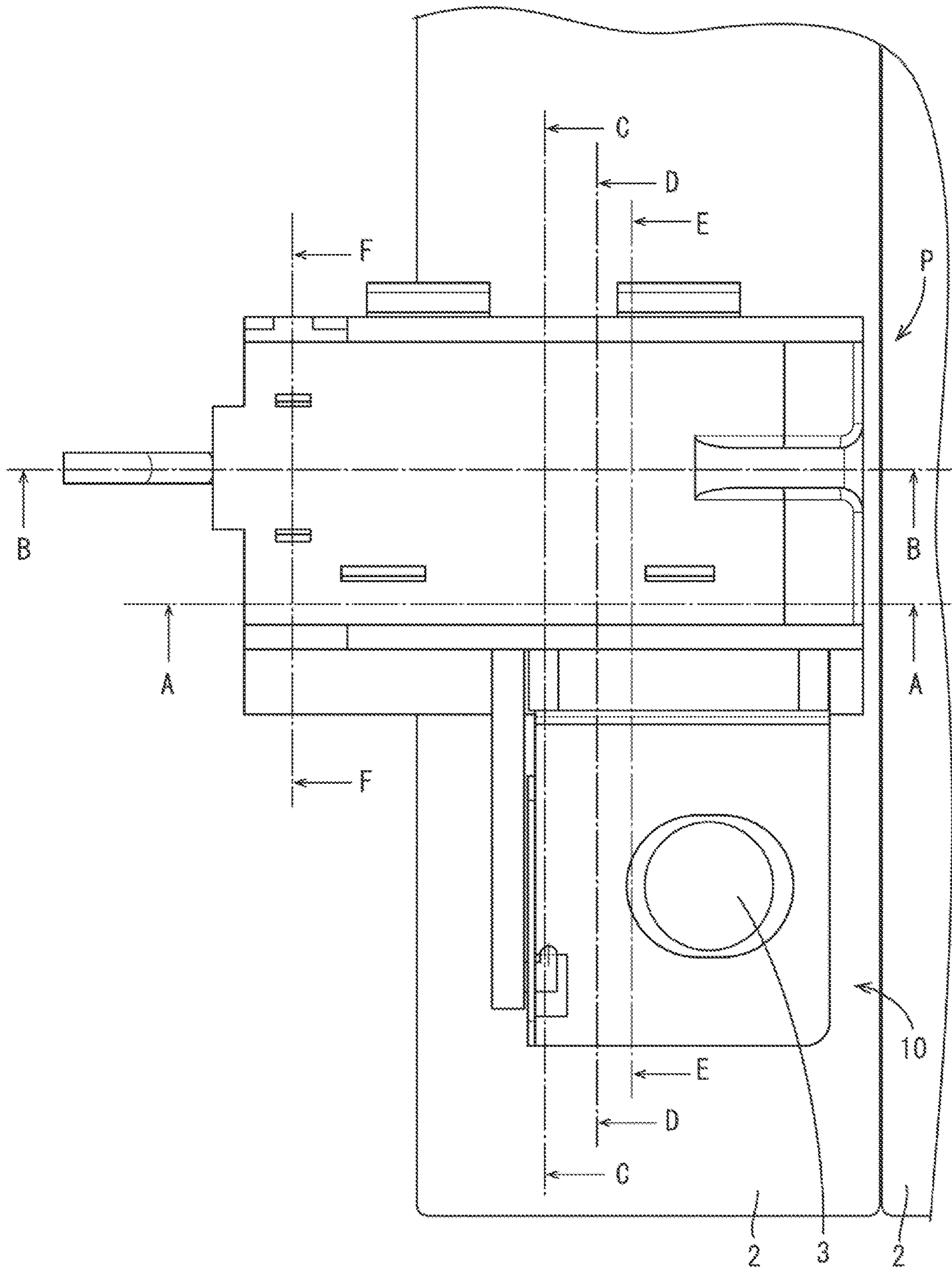


FIG. 18

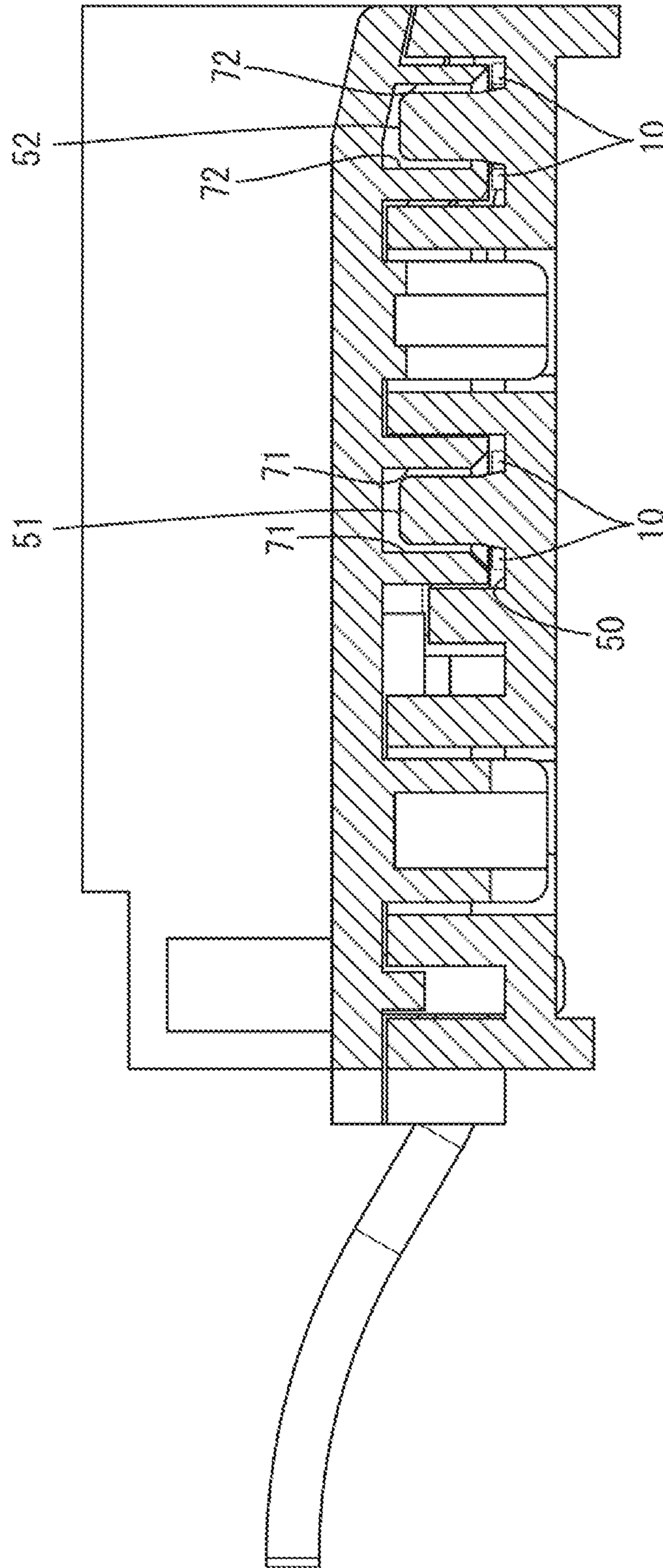


FIG.19

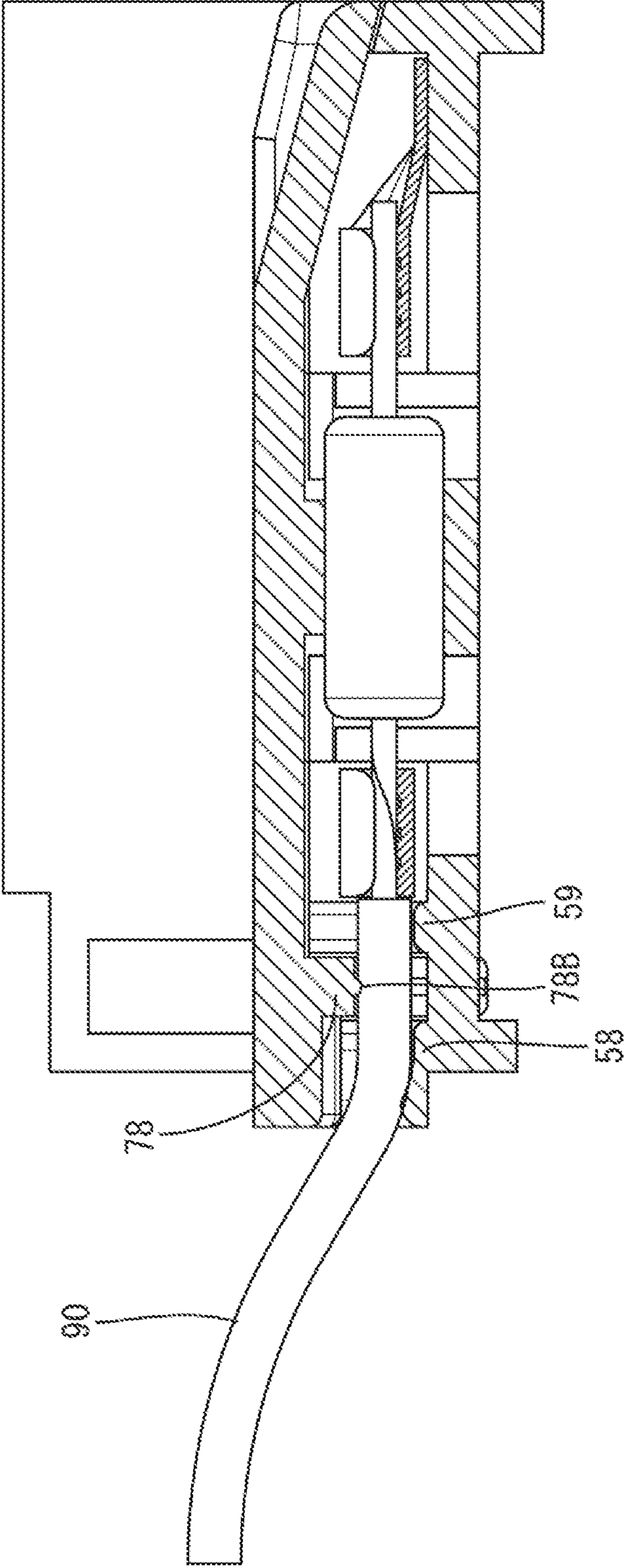


FIG.20

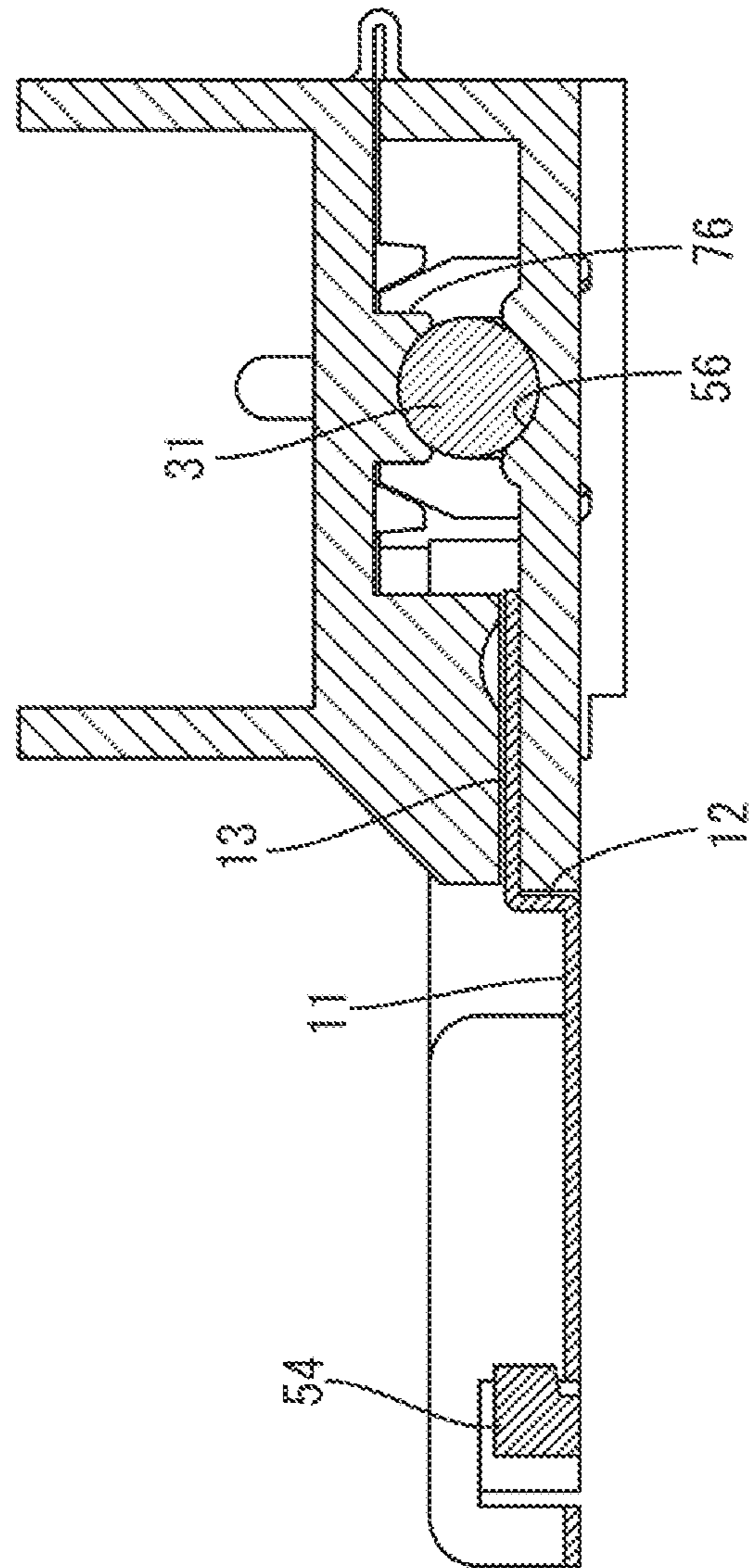


FIG.21

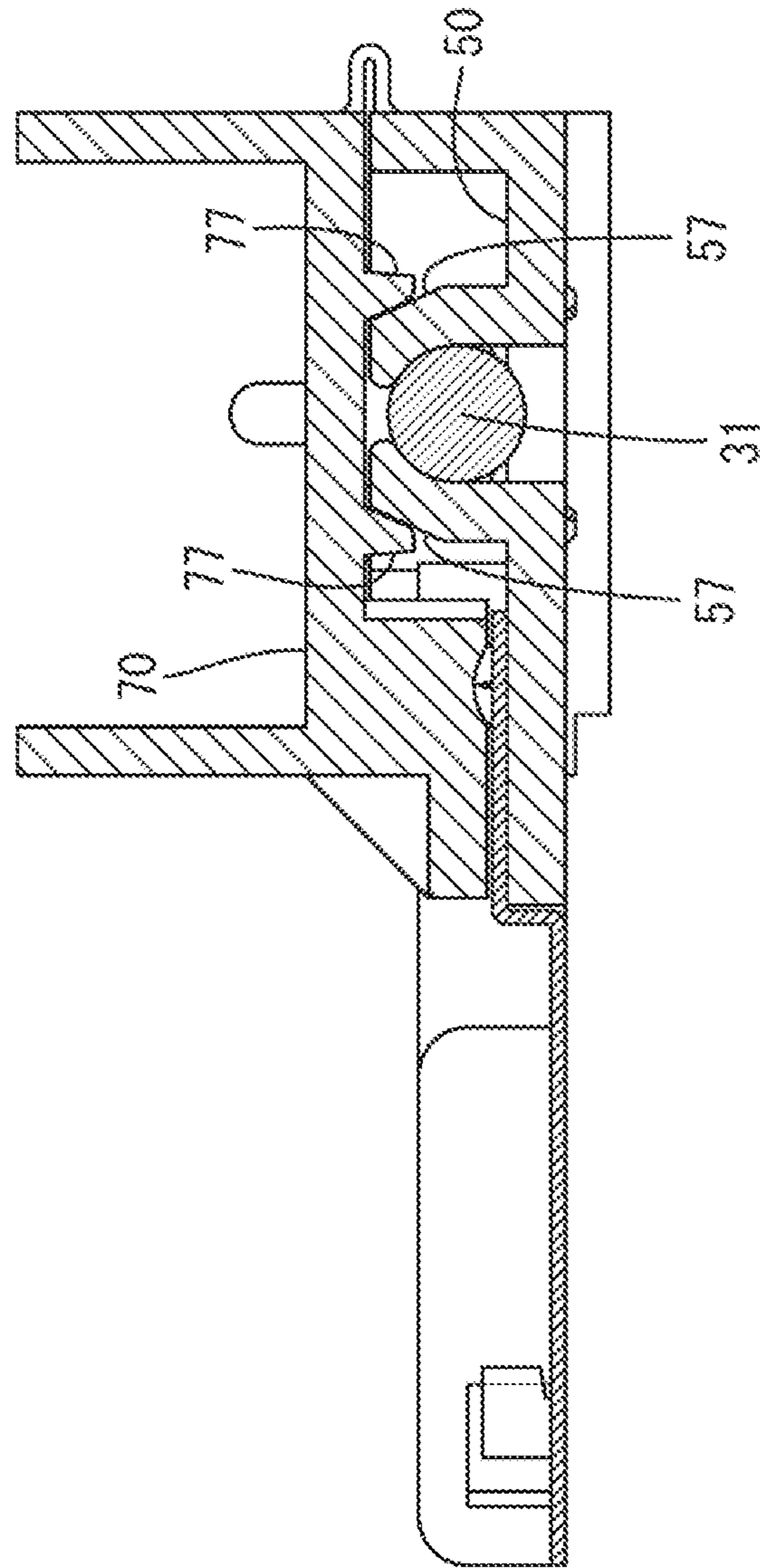


FIG.22

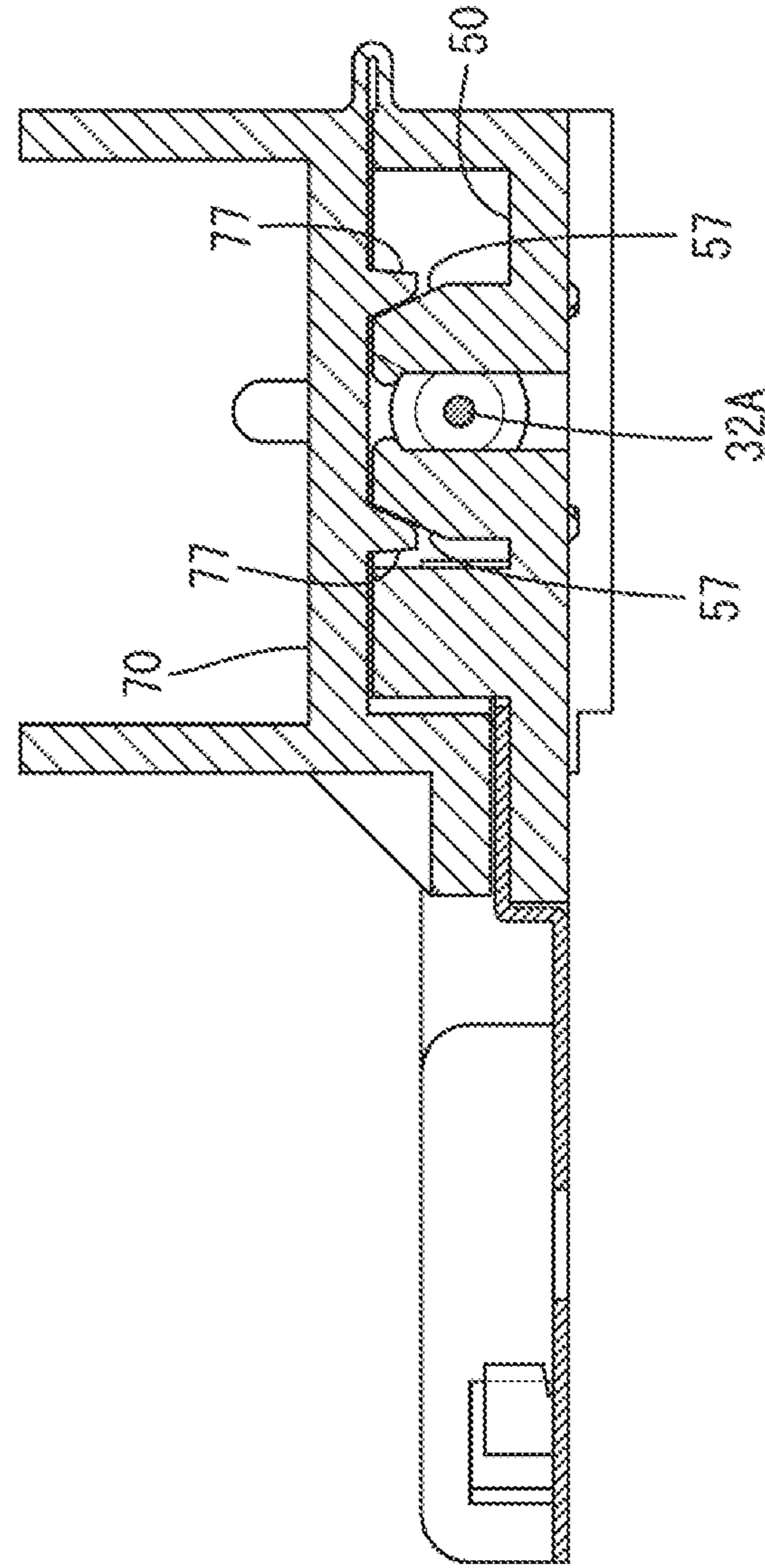
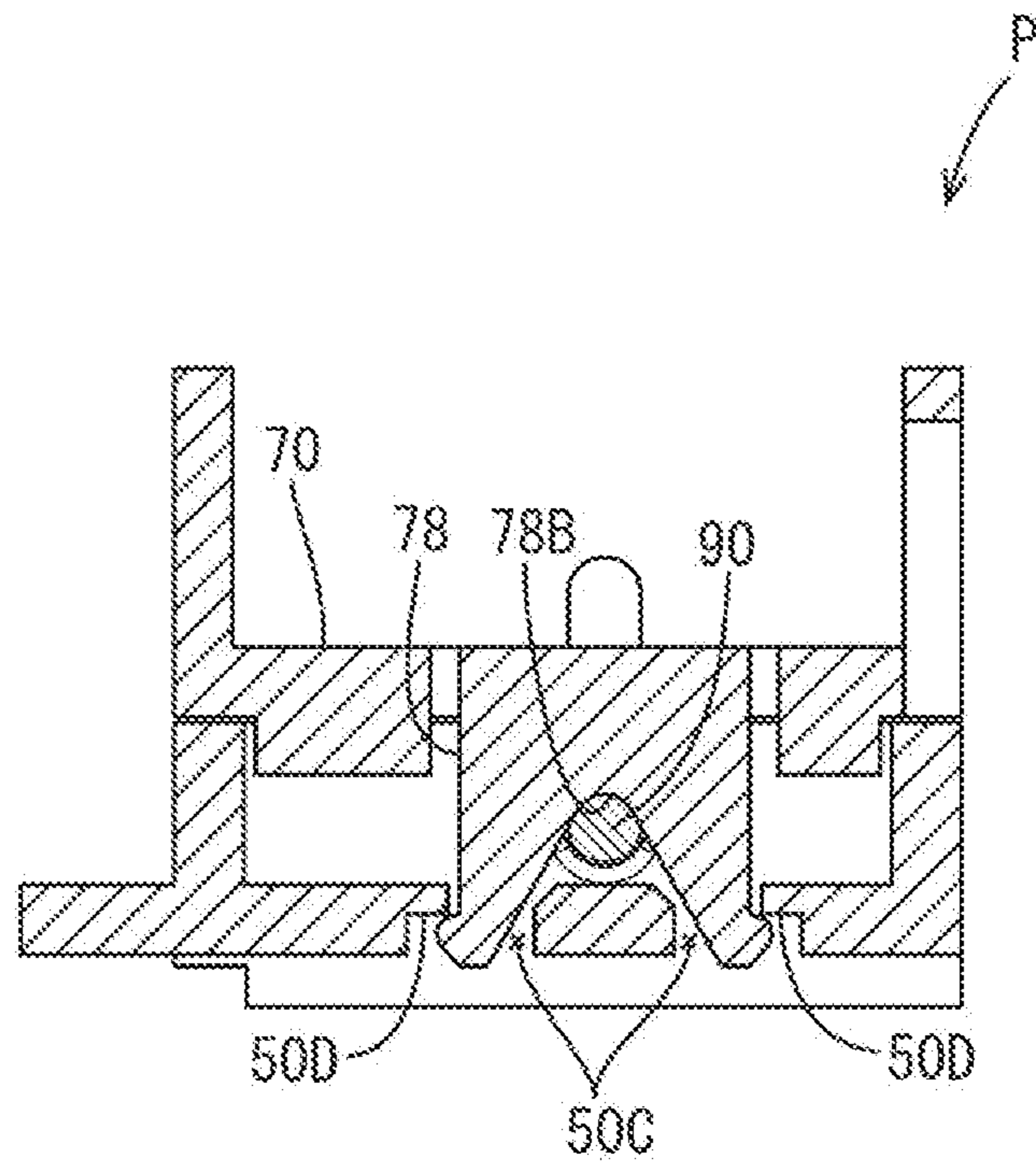
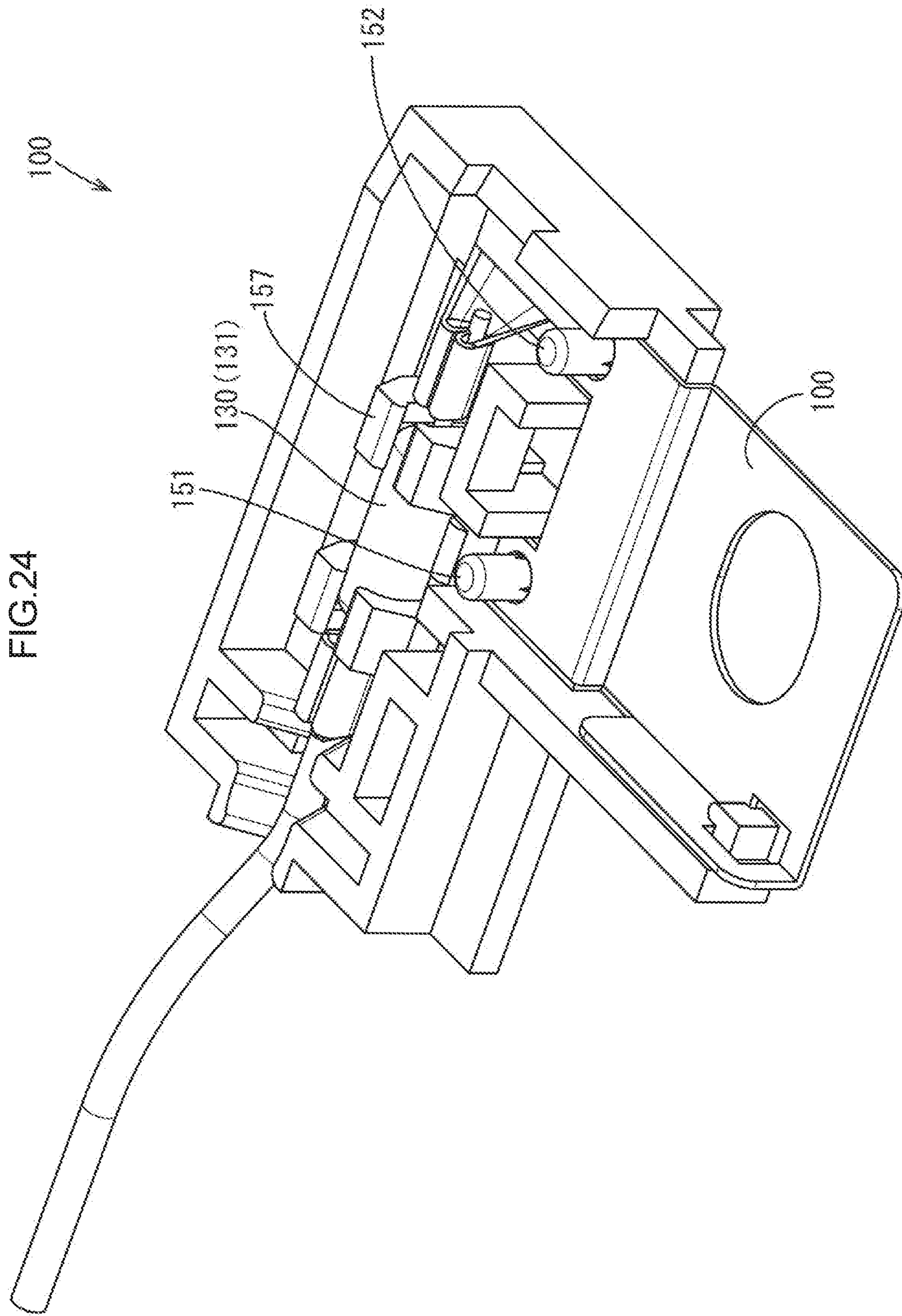




FIG. 23





**1****WIRING MODULE**

## TECHNICAL FIELD

The present invention relates to a wiring module.

## BACKGROUND ART

As a wiring module connected to a power storage module, a wiring module, in which a battery abnormality detection element for detecting an abnormality in a voltage or an abnormality in a temperature of a battery is connected to a conductor connecting batteries to each other or connecting a battery and a load to each other, has been known. In this case, since behaviors when an external force such as vibration or the like is applied are different due to a difference in mass between the abnormality detection element and the conductor, a load is apt to be applied to a part where the abnormality detection element and the conductor are connected to each other.

Therefore, for example, Patent Document 1 describes a configuration in which a conductor is fixed to a case and a fuse is fixed to a cover covering the case to integrally hold the conductor and the fuse.

## RELATED ART DOCUMENT

## Patent Document

[Patent Document 1] Japanese Unexamined Patent Application Publication No. 2015-207393 (pages 5 and 6, FIG. 2)

## SUMMARY OF THE INVENTION

## Problem to be Solved by the Invention

However, in this configuration, when fitting the conductor into the case and inserting an electrode to fix the electrode using a nut, since the conductor rotates, a connection terminal for connection to a fuse, which extends from the conductor, is liable to deviate from a regular position in a circumferential direction. In this case, when putting the cover later to mount the fuse, since a terminal of the fuse is fitted in a state of being relatively horizontally misaligned from the connection terminal of the conductor, it is apprehended that a connection failure occurs.

Moreover, even when the terminals of the conductor and the fuse are normally connected to each other, rattling occurs when an external force such as vibration or the like is applied at the time of use, due to a clearance caused by accumulated tolerances of the respective members including the conductor, the case, the fuse, and the cover, such that a load is apt to be applied to a part where the terminals are connected to each other.

The present invention is completed based on the reason described above, and an object of the present invention is to provide a wiring module which can securely fix an abnormality detection element and a terminal and retain a proper connection.

## Means for Solving the Problem

A wiring module according to a technology disclosed in the present description is a wiring module to be attached to a plurality of power elements which stores or generates power, the wiring module including: a connection conductor connecting the power elements to each other or connecting

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the power element and a load to each other; an abnormality detection element detecting an abnormality of the power element; and an insulating protector holding the connection conductor and the abnormality detection element. The insulating protector is integrally provided with a conductor holding portion which positions and holds the connection conductor by fitting the connection conductor thereonto, and an element holding portion which positions and holds the abnormality detection element by fitting the abnormality detection element thereinto.

In a case where the connection conductor and the abnormality detection element are connected, it is highly likely that connected parts of the connection conductor and the abnormality detection element are damaged due to application of a force caused by different behaviors occurring when an external force such as vibration is applied to the connection conductor and the abnormality detection element. However, according to the above configuration, since both of the connection conductor and the abnormality detection element are integrally fixed to the insulating protector, for example, there is no risk that the abnormality detection element shakes alone or only the connection conductor rotates together when the connection conductor is attached to the power element, and it is possible to suppress generation of a force applied to the connected part.

In addition, it is possible to integrally fix the connection conductor and the abnormality detection element only by fitting them onto the insulating protector, and thus, for example, there is no need to perform insert molding or the like, and cost reduction can be achieved.

As an aspect related to the wiring module disclosed in the present description, the following configuration is preferable.

(1) The conductor holding portion may include a tapered portion protruding from the insulating protector and press-fitted into a fitting hole formed in the connection conductor, and the element holding portion may include a pair of element holding claw portions between which the abnormality detection element is press-fitted and held.

(2) The conductor holding portion may include a first conductor holding portion and a second conductor holding portion, and the connection conductor may include a circular first holding hole portion fitted onto the tapered portion of the first conductor holding portion, and a second holding hole portion having an elongated shape in a radial direction around the first holding hole portion and fitted onto the tapered portion of the second conductor holding portion.

Each dimension of the connection conductor and the insulating protector has an error within a tolerance range. When fitting the insulating protector into the connection conductor, the smaller the clearance between the connection conductor and the insulating protector due to accumulated errors in dimension is, the closer the connection conductor and the insulating protector are fitted. In this case, however, since an extremely accurate alignment is required, a fitting operation becomes difficult. Further, the larger the clearance between the connection conductor and the insulating protector due to accumulated errors in dimension is, the easier the fitting operation becomes. In this case, however, fitting between the connection conductor and the insulating protector loosens, such that rattling becomes severe.

Whereas, according to the above configuration, since the first holding hole portion of the connection conductor is closely fitted onto the tapered portion of the first conductor holding portion, it is possible to prevent the rattling by absorbing the accumulated errors in dimension. Further, since the second holding hole portion has an ample dimen-

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sion in a radial direction around the first holding hole portion, it is easy to position the second holding hole portion with respect to the second conductor holding portion regardless of an amount of accumulated errors in dimension, and since the second holding hole portion is closely fitted on the tapered portion of the second conductor holding portion, it is possible to prevent rattling.

(3) The insulating protector may be provided with a pedestal portion on which the conductor holding portion and the element holding portion are provided, and a cover portion covering the conductor holding portion and the element holding portion, and the cover portion may be provided with a conductor pressing portion holding the connection conductor between the conductor pressing portion and the pedestal portion, and an auxiliary element holding portion holding the abnormality detection element between the auxiliary element holding portion and the pedestal portion.

(4) The auxiliary element holding portion may include a pair of opening preventing portions between which the pair of element holding claw portions is pinched.

According to this configuration, it is possible to closely fit the abnormality detection element onto the insulating protector only by fitting the abnormality detection element between the element holding claw portions. Further, thereafter, the element holding claw portions are pinched by the auxiliary element holding portions, such that it is possible to suppress an elastic deformation force of the claw portions. As a result, it is possible to retain a state where the abnormality detection element is securely fixed to the insulating protector even when an external force such as vibration is applied to the insulating protector.

#### Advantageous Effects of Invention

According to the present invention, the wiring module which can securely fix the abnormality detection element and the terminal and retain a proper connection can be provided.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a wiring module according to an embodiment.

FIG. 2 is a perspective view of a bus bar.

FIG. 3 is a top view of the bus bar.

FIG. 4 is a perspective view illustrating a state in which a fuse is connected to the bus bar.

FIG. 5 is a perspective view of an insulating protector.

FIG. 6 is a top view of the insulating protector.

FIG. 7 is a partially enlarged front view of the insulating protector.

FIG. 8 is a right side view illustrating a state before closing a cover of the wiring module.

FIG. 9 is a top view illustrating a state before closing the cover of the wiring module.

FIG. 10 is a cross-sectional view taken along A-A of FIG. 9.

FIG. 11 is a cross-sectional view taken along B-B of FIG. 9.

FIG. 12 is a cross-sectional view taken along C-C of FIG. 9.

FIG. 13 is a cross-sectional view taken along D-D of FIG. 9.

FIG. 14 is a cross-sectional view taken along E-E of FIG. 9.

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FIG. 15 is a cross-sectional view taken along F-F of FIG. 9.

FIG. 16 is a perspective view illustrating a state after closing the cover of the wiring module.

FIG. 17 is a top view illustrating a state after closing the cover of the wiring module.

FIG. 18 is a cross-sectional view taken along A-A of FIG. 17.

FIG. 19 is a cross-sectional view taken along B-B of FIG. 17.

FIG. 20 is a cross-sectional view taken along C-C of FIG. 17.

FIG. 21 is a cross-sectional view taken along D-D of FIG. 17.

FIG. 22 is a cross-sectional view taken along E-E of FIG. 17.

FIG. 23 is a cross-sectional view taken along F-F of FIG. 17.

FIG. 24 is a perspective view of a wiring module according to a modified example.

#### MODE FOR CARRYING OUT THE INVENTION

##### Embodiment

Embodiment 1 of the present invention will be described with reference to FIGS. 1 to 23. Note that in the following description, a Y direction, an X direction, and a Z direction in FIG. 1 point to the front, the left, and the top, respectively.

A wiring module 1 of the present embodiment is disposed on a power module used as a power supply in a vehicle such as an electric car or a hybrid car, and includes, as illustrated in FIG. 1, a bus bar 10 (an example of a connection conductor) connected to an electrode 3 of one of a plurality of power elements 2 constituting the power module, a fuse 30 (an example of an abnormality detection element) having one end portion connected to the bus bar 10, a detection wire 90 electrically connected to the other end portion of the fuse 30, and an insulating protector P integrally holding the bus bar 10, the fuse 30, and the detection wire 90.

The other end portion of the detection wire 90 is electrically connected to an electronic control unit (ECU) (not illustrated) which monitors a state of the power element 2 by detecting a voltage or the like, and the fuse 30 cuts-off a detection voltage when an abnormality occurs in a voltage of the power element 2. The fuse 30 is an example of the abnormality detection element. The abnormality detection element is not limited thereto and may be, for example, a thermistor which detects an abnormally high temperature.

As illustrated in FIGS. 2 and 3, the bus bar 10 is entirely formed of one metal plate, and includes a substantially rectangular lower step portion 11, an upper step portion 13 extending from a rear edge of the lower step portion 11 while passing through a step portion 12, and a connection portion 14 extending from a right end of a rear edge portion of the upper step portion 13.

A first holding hole portion 15 (an example of a fitting hole) having a substantially circular shape and penetrating through a plate surface is provided in the vicinity of a left end of a rear side of the upper step portion 13, and a second holding hole portion 16 (an example of the fitting hole) having a substantially elliptical shape which is elongated laterally (that is, in a radial direction around the first holding hole portion 15) and penetrating through the plate surface is provided in the vicinity of a right end of the rear side of the upper step portion 13. The first holding hole portion 15 and the second holding hole portion 16 are laterally aligned with

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a notch portion interposed therebetween. Specifically, the first holding hole portion **15** and the second holding hole portion **16** are disposed such that an extension line of a major axis of the second holding hole portion **16** passes through a central point of the first holding hole portion **15**.

An electrode insertion hole **17** having a substantially laterally elliptical shape and penetrating through the plate surface is provided at substantially the center of the lower step portion **11**.

Further, a mooring hole portion **18** having a substantially elliptical shape and penetrating through the plate surface is provided in the vicinity of a left end of a front side of the lower step portion **11**, and a portion near a left edge of the lower step portion **11** is bent upwardly at a substantially right angle along a line passing through the center of the mooring hole portion **18** in a right-left direction of the mooring hole portion **18** in a band shape to form an abutting wall portion **19**. That is, the mooring hole portion **18** has a cross-section in the right-left direction with an L-letter shape.

Further, as illustrated in FIG. 3, the mooring hole portion **18** is disposed such that an extension line of a right edge portion of the mooring hole portion **18** in the lower step portion **11** passes through the central point of the first holding hole portion **15**. In this case, the extension line of the major axis of the second holding hole portion **16** and the extension line of the right edge portion of the mooring hole portion **18** form a right angle with the central point of the first holding hole portion **15** as an apex.

The connection portion **14** has a rear end extending obliquely left-upward and a barrel portion **14A** having a substantial V-letter shape when viewed from the side is provided at a distal end of the extended portion of the connection portion **14**.

As illustrated in FIG. 4, the fuse **30** includes a fuse main body portion **31** having a substantially cylindrical shape, a first terminal portion **32A** extending from a central portion of a right end surface of the fuse main body portion **31**, and a second terminal portion **33A** extending from a central portion of a left end surface of the fuse main body portion **31**. The barrel portion **14A** of the bus bar **10** is caulked and crimped to the first terminal portion **32A**, and the second terminal portion **33A** is caulked and crimped to the detection wire **90** by using a known sleeve or the like. By doing so, the bus bar **10** and the detection wire **90** are electrically connected to each other through the fuse **30**.

The insulating protector **P** is formed of an insulating synthetic resin and integrally includes a pedestal portion **50** having a substantially rectangular parallelepiped plate shape, a cover portion **70** connected to a rear wall portion **61** provided at a rear end of the pedestal portion **50** through a hinge as illustrated in FIGS. 5 to 8.

A first holding shaft portion **51** (an example of a conductor holding portion) and a second holding shaft portion **52** (an example of a conductor holding portion) for fixing the bus bar **10**, and an element holding portion **55** for holding the fuse **30** are provided on an upper portion of the pedestal portion **50**.

The first holding shaft portion **51** (an example of the first conductor holding portion) and the second holding shaft portion **52** (an example of the second conductor holding portion) are laterally aligned in a region corresponding to a substantially right-half of a front side of the pedestal portion **50**. The holding shaft portions **51** and **52** each have a substantially cylindrical shape, and integrally protrude from a plate surface of the pedestal portion **50**. A plurality (in the present embodiment, four for each holding shaft portion) of tapered portions **51B** and **52B** which are expanded toward

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the pedestal portion **50** are integrally provided on base ends of the holding shaft portions **51** and **52**. The four tapered portions **51B** and the four tapered portions **52B** are radially arranged at intervals of 90 degrees in a circumferential direction around shaft centers of the cylindrical holding shaft portions **51** and **52**, respectively, and have lower ends connected to the plate surface of the pedestal portion **50**.

An extension wall portion **53** having a prism shape and extending forward from a substantially central portion in the right-left direction is provided at the front side of the pedestal portion **50**. A mooring claw portion **54** to be moored to the mooring hole portion **18** of the bus bar **10** extends from a right side surface of a distal end portion of the extension wall portion **53**. As illustrated in FIG. 6, the mooring claw portion **54** extends from the distal end portion of the extension wall portion **53** to the right and a distal end of the mooring claw portion **54** extends rearward, such that the mooring claw portion **54** is formed in a hook shape as a whole. A positioning step portion **54A** is provided at a lower end portion of a portion extending rearward from the mooring claw portion **54** as illustrated in FIG. 8.

The element holding portion **55** includes a fuse placing portion **56** for placing the fuse **30**, and fuse clipping portions **57** (an example of an element holding claw portion) for fixing the fuse **30**.

The fuse placing portion **56** is formed in a substantially central portion of the pedestal portion **50** in the left-right direction and is formed as a concave surface having a cross section with an arc shape when viewed from the side. Front and rear edge portions of the fuse placing portion **56** rise while having a cross section with an arc shape when viewed from the side.

The fuse clipping portions **57** protrude from the pedestal portion **50** while being arranged at intervals in a front-rear direction and the right-left direction such that a plurality (in the present embodiment, four) of clipping claw portions **57A** surround the fuse placing portion **56**. The clipping claw portions **57A** disposed at the front side and the clipping claw portions **57A** disposed at the rear side among the clipping claw portions **57A** are formed in pair, respectively, and are curved such that upper ends face each other, and as a result, an inner surface of the clipping claw portion **57A** becomes a concave surface with an arc shape. Two clipping claw portions **57A** disposed at a left side of the fuse placing portion **56** are provided with protruding portions **57B** having a plate shape at left side portions of the clipping claw portions **57A**, respectively, and two clipping claw portions **57A** disposed at a right side of the fuse placing portion **56** are provided with protruding portions **57B** having a plate shape at right side portions of the clipping claw portions **57A**, respectively.

A left wall portion **58** and a middle wall portion **59** are formed at a left end portion of the pedestal portion **50** so as to rise from the pedestal portion **50** while having plate surfaces facing each other in parallel. A first conduction groove **58A** and a second conduction groove **59A** forming a V-letter shape when viewed from the side are provided at substantially central portions of the left wall portion **58** and the middle wall portion **59** in the front-rear direction, respectively. A width and a depth of the conduction groove **58A** and a width and a depth of the conduction groove **59A** are substantially the same as each other, respectively. A bottom portion of each of the conduction grooves **58A** and **59A** has a U-letter shape when viewed from the side, and protrudes to have a cross section with a semi-circular shape along a central line in a thickness direction (right-left direction). Further, in a region of the pedestal portion **50**,

which is sandwiched between the left wall portion **58** and the middle wall portion **59**, wire locking holes **50C** for fitting and locking wire locking portions **78C** of a fitting wall portion **78** to be described later, which penetrate through the plate surface, are provided, and outer edge portions of the wire locking holes **50C** in the front-rear direction become wire locking receiving portions **50D**.

A right wall portion **60** is formed so as to rise from the pedestal portion **50** at a right end portion of the pedestal portion **50**. Further, a front wall portion **62** is provided so as to rise at a portion slightly behind a front edge portion of the pedestal portion **50**, and connects a front end portion of the left wall portion **58**, a front end portion of the middle wall portion **59**, and a left wall surface of the extension wall portion **53** to one another. The pedestal portion **50** is further provided with locking receiving portions **63** for fitting locking portions **79** provided on a cover portion **70** to be described later, which are laterally aligned at two places in a region adjacent to the front side of the pedestal portion **50**. Further, connection checking openings **64** penetrating through the plate surface are provided in regions at the left and right sides of a region of which four corners are defined by the fuse clipping portions **57** on the pedestal portion **50**.

The cover portion **70** includes bus bar pressing portions **71** and **72** (an example of a conductor pressing portion) and an auxiliary fuse holding portion **75** (an example of an auxiliary element holding portion) on an upper surface in FIG. 5.

The bus bar pressing portions **71** and **72** are constituted by a first bus bar pressing portion **71** and a second bus bar pressing portion **72**, and are provided while being laterally aligned adjacent to a rear end portion of the cover portion **70** in a region corresponding to a substantially right half of the cover portion **70**. The first bus bar pressing portion **71** and the second bus bar pressing portion **72** each have a cylindrical shape integrally protruding from a plate surface of the cover portion **70**, and distal end portions of the first bus bar pressing portion **71** and the second bus bar pressing portion **72** become tapered circumferential surface portions **71A** and **72A**, each of which an inner diameter is increased toward an upper side. Further, a bus bar pressing surface **73** which is one step higher than an upper surface of the cover portion **70** is provided in an area behind both of the bus bar pressing portions **71** and **72**. A dimension of a step between the upper surface of the cover portion **70** and the bus bar pressing surface **73** is substantially the same as a height of each of the bus bar pressing portions **71** and **72**. That is, upper edge portions of both of the bus bar pressing portions **71** and **72** are on the same level as that of the bus bar pressing surface **73**.

The auxiliary fuse holding portion **75** includes a fuse pressing portion **76** abutting the fuse **30** from above, and opening preventing portions **77** (an example of the element holding claw portion) for the fuse clipping portions **57** provided on the pedestal portion **50**.

The fuse pressing portion **76** protrudes from a substantially central portion of the upper surface of the cover portion **70**, and is provided with a concave surface having a cross section with an arc shape when viewed from the side.

The opening preventing portions **77** is formed in a form in which four opening preventing pieces protrude from the cover portion **70** while being arranged at intervals in the front-rear direction and the right-left direction so as to surround the fuse pressing portion **76** at the center. An inner surface of each opening preventing piece in the front-rear

direction is a tapered surface which is tapered toward an upper side of the opening preventing piece when viewed from the side.

In a region slightly right from a left end portion of the cover portion **70**, the fitting wall portion **78** is formed so as to rise from the cover portion **70** in parallel to the left end portion of the cover portion **70**. A top-face conduction groove **78A** having a V-letter shape when viewed from the side is provided at a substantially central portion of the fitting wall portion **78** in the front-rear direction. A bottom portion of the top-face conduction groove **78A** has a U-letter shape when viewed from the side. The top-face conduction groove **78A** is provided with a wire pressing portion **78B** having a cross section with a semi-circular shape along a central line in a thickness direction (right-left direction) and protruding from the top-face conduction groove **78A**. Further, the wire locking portions **78C** to be fitted into and locked to the wire locking receiving portions **50D** are provided while protruding forward and backward from both front and rear upper end portions of the top-face conduction groove **78A**.

Two locking portions **79** fitted into the locking receiving portions **63** of the pedestal portion **50** are provided while being laterally aligned in a region adjacent to the rear end portion of the cover portion **70**.

Next, an order in which the bus bar **10**, the fuse **30**, and the detection wire **90** connected to one another by caulking and crimping are assembled to the insulating protector P will be described.

First, the mooring claw portion **54** provided on the extension wall portion **53** of the insulating protector P is inserted into the mooring hole portion **18** provided in the lower step portion **11** of the bus bar **10**, and then the bus bar **10** is moved forward relative to the insulating protector P, such that a rear end surface of the positioning step portion **54A** of the mooring claw portion **54** abuts a rear edge portion of the mooring hole portion **18**. In this state, the first holding shaft portion **51** of the insulating protector P is put into the first holding hole portion **15** of the bus bar **10**, and at the same time, position adjustment is performed such that the second holding shaft portion **52** of the insulating protector P is fitted into the second holding hole portion **16** of the bus bar **10**, and then the first holding hole portion **15** and the second holding hole portion **16** are press-fitted onto the tapered portion **51B** of the first holding shaft portion **51** and the tapered portion **52B** of the second holding shaft portion **52**, respectively.

In this case, as illustrated in FIG. 10, the holding hole portions **15** and **16** are closely fitted at any of height positions on the tapered portions **51B** and **52B** of the holding shaft portions **51** and **52** of the insulating protector P, respectively. Note that FIG. 10 illustrates a state in which the holding hole portions **15** and **16** are closely fitted onto lowermost portions of the tapered portions **51B** and **52B**, respectively (that is, a lower surface of the bus bar **10** abuts the plate surface of the pedestal portion **50**). Further, as illustrated in FIG. 9, the abutting wall portion **19** of the bus bar **10** and the extension wall portion **53** of the insulating protector P face each other with a slight clearance caused by accumulated errors in dimension or closely abut (in close contact with) each other in a case where there is no clearance. Further, a right edge portion of the upper step portion **13** of the bus bar **10** and the right wall portion **60** of the insulating protector P face each other with a slight clearance caused by accumulated errors in dimension or closely abut each other in a case where there is no clearance. Further, a back surface of the step portion **12** of the bus bar **10** and a

front edge portion of the insulating protector P face each other with a slight clearance caused by accumulated errors in dimension or closely abut each other in a case where there is no clearance.

Next, the fuse 30 is put between the fuse clipping portions 57 provided in the insulating protector P from above. Then, the two clipping claw portions 57A receive the fuse 30 while being elastically deformed in a direction in which the clipping claw portions 57A become distant from each other, and when the fuse 30 is placed on the fuse placing portion 56 (FIGS. 11 and 12), the clipping claw portions 57A are elastically restored to clip a circumferential surface of the fuse 30 from the front and rear sides of the fuse 30 (FIG. 13). In this case, left and right end surfaces of the fuse 30 face inner surfaces of the protruding portions 57B of the fuse clipping portions 57, respectively, and both terminals 32A and 33A of the fuse 30 are held between the protruding portions 57B (FIG. 14).

Then, as illustrated in FIG. 15, the wire is placed on the conduction grooves 58A and 59A provided in the insulating protector P and then the cover portion 70 is put, such that the locking portions 79 are inserted into and locked to the locking receiving portions 63, respectively, and at the same time, the wire locking portions 78C are inserted into the wire locking holes 50C to be locked to the wire locking receiving portions 50D (FIGS. 16, 17, and 23).

In this case, as illustrated in FIG. 18, the first bus bar pressing portion 71 and the second bus bar pressing portion 72 cover the first holding shaft portion 51 and the second holding shaft portion 52, respectively, and the bus bar 10 is pressed between the upper edge portions of the bus bar pressing portions 71 and 72, and the pedestal portion 50.

Further, the fuse pressing portion 76 abuts the fuse main body portion 31 from above and the fuse placing portion 56 supports the fuse main body portion 31 from below as illustrated in FIG. 20, and a pair of front and rear opening preventing portions 77 pinches a pair of fuse clipping portions 57 from the front side and the rear side of the pair of opening preventing portions 77 as illustrated in FIGS. 21 and 22.

As illustrated in FIGS. 19 and 23, the fitting wall portion 78 of the cover is fitted between the left wall portion 58 and the middle wall portion 59 of the pedestal portion 50, and the wire pressing portion 78B presses the detection wire 90 while making a dent in a sheath portion of the detection wire 90. As a result, the bus bar 10, the fuse 30, and the detection wire 90 are closely fixed in the insulating protector P.

According to the configuration as described above, since the first holding hole portion 15 of the bus bar 10 is closely fitted onto the tapered portion 51B of the first holding shaft portion 51 of the insulating protector P in a front-rear direction and a right-left direction of an inner diameter of the first holding hole portion 15, displacement of the bus bar 10 in a direction other than a circumferential direction of the first holding shaft portion 51 as the center is restricted. In addition, since the second holding hole portion 16 of the bus bar 10 has an elliptical shape in the right-left direction, positioning of the second holding hole portion 16 with respect to the second holding shaft portion 52 of the insulating protector P becomes easy regardless of an amount of accumulated errors in dimension, and since the second holding hole portion 16 of the bus bar 10 is closely fitted onto the tapered portion 52B of the second holding shaft portion 52, displacement of the bus bar 10 in the circumferential direction of the first holding shaft portion 51 as the center is restricted. As a result, the displacement of the bus

bar 10 in all directions is restricted, such that it is possible to securely fix the bus bar 10 to the insulating protector P.

Further, since the left and right edge portions of the bus bar 10 and three surfaces of the step portion 12 face the wall portion of the insulating protector P or a thickness surface of the plate surface, a possibility that a clearance disappears due to accumulated errors in any dimension, such that the bus bar 10 closely abuts the insulating protector P increases, and it is possible to more securely fix the bus bar 10 to the insulating protector P.

In addition, the fuse 30 is pressed by the fuse clipping portions 57, the fuse placing portion 56, and the fuse pressing portion 76, and the fuse clipping portions 57 are pinched by the opening preventing portion 77 such that opening thereof is prevented, thereby making it possible to securely fix the fuse 30 to the insulating protector P.

Further, the detection wire 90 is pinched between the left wall portion 58, the fitting wall portion 78, and the middle wall portion 59, thereby making it possible to securely fix the insulating protector P.

As described above, in the wiring module 1 of the present embodiment, the bus bar 10, the fuse 30, and the detection wire 90 are securely fixed to the insulating protector P, and thus it is possible to isolate respective connected places where the fuse 30, the bus bar 10, and the detection wire 90 are connected to one another from a rotational force applied to the bus bar 10 when inserting the electrode 3 of the power element 2 into the electrode insertion hole 17 and fastening the electrode 3 with a nut, vibration at the time of use, and an external force such as a tensile force applied to the wire, thereby making it possible to retain a proper connection in the respective connected places.

Note that in the present embodiment, the connection checking openings 64 are provided in the insulating protector P at portions corresponding to the respective connected places where the fuse 30, the bus bar 10, and the detection wire 90 are connected to one another, and thus it is possible to check a connection state in a state in which the cover is put.

#### Other Embodiments

The present invention is not limited to the embodiment described with reference to the drawings, and can be implemented, for example, in the following modes.

(1) The insulating protector P includes the cover portion 70 in the above embodiment, but the cover portion 70 is not necessarily required. For example, in a case where there is little possibility that the detection wire 90 is strained such that an external force is applied to the connected place between the detection wire 90 and the fuse 30, or in a case where an elastic deformation force of the fuse clipping portion 57 is weak and a sufficient force to clip the fuse 30 can be maintained without the opening preventing portion 77, a wiring module 100 which does not have the cover portion 70 as illustrated in FIG. 24 may be provided. By doing so, miniaturization of the wiring module can be achieved.

(2) In the above embodiment, the bus bar 10 includes the first holding hole portion 15 and the second holding hole portion 16, and the insulating protector P includes the first holding shaft portion 51 and the second holding shaft portion 52. However, the second holding hole portion 16 and the second holding shaft portion 52 are not necessarily required. For example, a tolerance may be set such that a clearance or the like between the left edge portion of the bus bar 10 and the extension wall portion 53 of the insulating

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protector P becomes small instead. The point is that the bus bar 10 should be able to be fixed to the insulating protector P.

(3) In the above embodiment, the insulating protector P includes the opening preventing portions 77 for the fuse clipping portion 57, but the opening preventing portions 77 are not necessarily required. For example, in a case where an elastic deformation force of the fuse clipping portion 57 is weak and a sufficient clipping force with respect to the fuse 30 can be maintained, the opening preventing portions 77 can be omitted.

## EXPLANATION OF SYMBOLS

1: Wiring module  
 2: Power element  
 10: Bus bar  
 16: Second holding hole portion  
 17: Electrode insertion hole  
 18: Mooring hole portion  
 30: Fuse  
 P: Insulating protector  
 50: Pedestal portion  
 51: First holding shaft portion  
 52: Second holding shaft portion  
 55: Element holding portion  
 56: Fuse placing portion  
 57: Fuse clipping portion  
 58A: First conduction groove  
 59A: Second conduction groove  
 70: Cover portion  
 71: First bus bar pressing portion  
 72: Second bus bar pressing portion  
 71A, 72A: Tapered circumferential surface portion  
 76: Fuse pressing portion  
 77: Opening preventing portion  
 78: Fitting wall portion  
 90: Detection wire

The invention claimed is:

1. A wiring module to be attached to a plurality of power elements which store or generate power, the wiring module comprising:

a connection conductor connecting the power elements to each other or connecting a power element among the power elements and a load to each other, the connection conductor having a barrel portion;

an abnormality detection element detecting an abnormality of the power element; and

an insulating protector holding the connection conductor and the abnormality detection element,

wherein the insulating protector is integrally provided with a conductor holding portion which positions and holds the connection conductor by fitting the connection conductor thereonto, and an element holding portion which positions and holds the abnormality detection element by fitting the abnormality detection element thereinto,

wherein:

the abnormality detection element is a fuse including a terminal portion,

the barrel portion of the connection conductor is crimped to the terminal portion,

the conductor holding portion includes a tapered portion protruding from the insulating protector and press-fitted into a fitting hole formed in the connection conductor, and the element holding portion includes a

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pair of element holding claw portions between which the abnormality detection element is press-fitted and held, and

the conductor holding portion includes a first conductor holding portion and a second conductor holding portion, the fitting hole includes a circular first holding hole portion and a second holding hole portion, and the connection conductor includes the circular first holding hole portion fitted onto the tapered portion of the first conductor holding portion, and the second holding hole portion having an elongated shape in a radial direction around the first holding hole portion and fitted onto the tapered portion of the second conductor holding portion.

2. The wiring module according to claim 1, wherein the insulating protector is provided with a pedestal portion on which the conductor holding portion and the element holding portion are provided, and a cover portion covering the conductor holding portion and the element holding portion, and

the cover portion is provided with a conductor pressing portion holding the connection conductor between the conductor pressing portion and the pedestal portion, and an auxiliary element holding portion holding the abnormality detection element between the auxiliary element holding portion and the pedestal portion.

3. The wiring module according to claim 2, wherein the auxiliary element holding portion includes a pair of opening preventing portions between which the pair of element holding claw portions is pinched.

4. A wiring module to be attached to a plurality of power elements which store or generate power, the wiring module comprising:

a connection conductor connecting the power elements to each other or connecting a power element among the power elements and a load to each other, the connection conductor having a barrel portion;

an abnormality detection element detecting an abnormality of the power element; and

an insulating protector holding the connection conductor and the abnormality detection element,

wherein the insulating protector is integrally provided with a conductor holding portion which positions and holds the connection conductor by fitting the connection conductor thereonto, and an element holding portion which positions and holds the abnormality detection element by fitting the abnormality detection element thereinto,

wherein:

the abnormality detection element is a fuse including a terminal portion,

the barrel portion of the connection conductor is crimped to the terminal portion,

the insulating protector is provided with a pedestal portion on which the conductor holding portion and the element holding portion are provided, and a cover portion covering the conductor holding portion and the element holding portion, and

the cover portion is provided with a conductor pressing portion holding the connection conductor between the conductor pressing portion and the pedestal portion, and an auxiliary element holding portion holding the abnormality detection element between the auxiliary element holding portion and the pedestal portion.

5. The wiring module according to claim 4, wherein the conductor holding portion includes a tapered portion protruding from the insulating protector and press-



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fitted into a fitting hole formed in the connection conductor, and the element holding portion includes a pair of element holding claw portions between which the abnormality detection element is press-fitted and held, and

the auxiliary element holding portion includes a pair of opening preventing portions between which the pair of element holding claw portions is pinched.

6. A wiring module to be attached to a plurality of power elements which store or generate power, the wiring module comprising:

a connection conductor connecting the power elements to each other or connecting a power element among the power elements and a load to each other, the connection conductor having a barrel portion;

an abnormality detection element detecting an abnormality of the power element; and

an insulating protector holding the connection conductor and the abnormality detection element,

wherein the insulating protector is integrally provided with a conductor holding portion which positions and holds the connection conductor by fitting the connection conductor thereonto, and an element holding portion which positions and holds the abnormality detection element by fitting the abnormality detection element thereinto,

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wherein:

the abnormality detection element is a fuse including a terminal portion,

the barrel portion of the connection conductor is crimped to the terminal portion,

the conductor holding portion includes a tapered portion protruding from the insulating protector and press-fitted into a fitting hole formed in the connection conductor, and the element holding portion includes a pair of element holding claw portions between which the abnormality detection element is press-fitted and held,

the insulating protector is provided with a pedestal portion on which the conductor holding portion and the element holding portion are provided, and a cover portion covering the conductor holding portion and the element holding portion, and

the cover portion is provided with a conductor pressing portion holding the connection conductor between the conductor pressing portion and the pedestal portion, and an auxiliary element holding portion holding the abnormality detection element between the auxiliary element holding portion and the pedestal portion.

7. The wiring module according to claim 6, wherein the auxiliary element holding portion includes a pair of opening preventing portions between which the pair of element holding claw portions is pinched.

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